



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
33000 NIXIE WAY, BLDG 50 Suite 207
SAN DIEGO, CA 92147

5000-33A
Ser BPMOW.lh/141
May 18, 2020

Karen Ueno
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street SFD-8-3
San Francisco, CA 94105-3901

Nina Bacey
Department of Toxic Substances Control
700 Heinz Avenue, Bldg. F, Suite 200
Berkeley, CA 94710-2737

Tina Low
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Dear BCT Members:

Please see the enclosed Parcel E-2 Final Landfill Gas Monitoring Report for January-March 2020, Post-Removal Action, Industrial Landfill at Hunters Point Naval Shipyard, San Francisco, California dated May 18, 2020.

If you have any questions regarding this report, please contact Leslie Howard at (619) 524-5903.

Sincerely,

Derek J. Robinson

DEREK J. ROBINSON
BRAC Environmental Coordinator
By direction of the Director

Enclosure 1. Parcel E-2 Final Landfill Gas Monitoring Report for January-March 2020,
Post- Removal Action, Industrial Landfill at Hunters Point Naval Shipyard,
San Francisco, California, May 18, 2020

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May 18, 2020

Copy to: (CD only)
City of San Francisco
Local Enforcement Agency
Program for Solid Waste Facilities
1390 Market St., Suite 210
San Francisco, CA 94102

Randy Brandt PG
Geosyntec Consultants
1111 Broadway, 6th Floor
Oakland, CA 94607

Amy Brownell
City of San Francisco
1390 Market St., Suite 210
San Francisco, CA 9
San Francisco, CA 94102

Jamie Egan
Jacobs
4 Embarcadero Center, Suite 38
San Francisco, CA 94111

Copy to: (Hard copy and CD)
Diane Silva
NAVFAC SWDIV
NAVFAC SWDIV Code EV33
NBSD Bldg 3519
2965 Mole Road
San Diego, CA 92136

Christina Rain
Langan
135 Main St., Suite 150
San Francisco, CA 94105

Karen Ueno
USEPA
75 Hawthorne Street SFD-8-3
San Francisco, CA 94105

Radhika Sreenivasan
E2 Consulting Engineers, Inc
2100 Powell Street, Suite 850
Emeryville, CA 94608

Daniel Hansen
Five Point
One Sansome St, Suite 3200
San Francisco, CA 94104

Michael Sharpless
Paul Hastings LLP
101 California Street, 48th Floor
San Francisco, CA 94111

Andrea Ruiz-Esquide
City of San Francisco
City Hall, Room 234
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

Wayne Praskins
USEPA
75 Hawthorne Street SFD-8
San Francisco, CA 94105

Alfred Worcester
Cal Recycle
Department of Resources Recycling and
Recovery
Closure and Technical Support Section
1001 I Street PO Box 4025
Sacramento, CA 95812

Nina Bacey
Cal/EPA
700 Heinz Avenue, Bldg F, Suite 200
Berkeley, CA 94710

Jeff White
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

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May 18, 2020

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Mitzi Kanbara
City of San Francisco Public Library
100 Larkin Street, 5th Floor
San Francisco, CA 94102



**Naval Facilities Engineering Command Southwest
BRAC PMO West
San Diego, CA**

**FINAL
LANDFILL GAS MONITORING REPORT FOR
JANUARY-MARCH 2020**

Post-Removal Action, Parcel E-2, Industrial Landfill

HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CA

May 2020

Approved for public release; distribution is unlimited

DCN: INYA-0009-0000-0004



**Naval Facilities Engineering Command Southwest
BRAC PMO West
San Diego, CA**

**FINAL
LANDFILL GAS MONITORING REPORT FOR
JANUARY-MARCH 2020**

Post-Removal Action, Parcel E-2, Industrial Landfill

HUNTERS POINT NAVAL SHIPYARD, SAN FRANCISCO, CA

May 2020

Prepared for:



**Department of the Navy
Naval Facilities Engineering Command Southwest
BRAC PMO West
33000 Nixie Way, Bldg 50
San Diego, CA 92147**

Prepared by:



**INYA Incorporated
20955 Pathfinder Road, Suite 100
Diamond Bar, CA 91765**

Contract Number: N62473-19-C-0009
DCN: INYA-0009-0000-0004

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Acronyms and Abbreviations

%	percent
°F	degrees Fahrenheit
§	Section (precedes section number in citing regulations)
BAAQMD	Bay Area Air Quality Management District
BCT	BRAC Cleanup Team
bgs	below ground surface
BRAC	Base Realignment and Closure
btoc	below top of casing
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIWMB	California Integrated Waste Management Board
DP	discharge point
DTSC	Department of Toxic Substances Control
ft	feet
GMP	gas monitoring probe
HPNS	Hunters Point Naval Shipyard
in.	inches
INYA	INYA Inc.
IR	Installation Restoration
IR-01/21	Installation Restoration Site 01/21
ITSI	Innovative Technical Solutions, Inc.
LEL	lower explosive limit
MCP	Final Interim Landfill Gas Monitoring and Control Plan
mph	miles per hour
msl	mean sea level
MW	monitoring well
NA	not applicable
Navy	U.S. Department of the Navy
NMOC	non-methane organic compound
PG&E	Pacific Gas and Electric
PID	photoionization detector
ppmv	parts per million by volume
PV	passive vent
RCRA	Resource Conservation and Recovery Act
TCRA	time-critical removal action
Tetra Tech	Tetra Tech EM Inc.
UCSF	University of California, San Francisco
VOC	volatile organic compound

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1 Introduction

INYA Inc. (INYA) received Contract No. N62473-19-C-0009 from the U.S. Department of the Navy (Navy), Base Realignment and Closure Program Management Office, West to provide technical support at Hunters Point Naval Shipyard (HPNS) in San Francisco, California. Under this contract, INYA will be monitoring and, if necessary, controlling migration of landfill gas from the Industrial Landfill in Installation Restoration (IR) Site 01/21 (IR-01/21) within Parcel E-2 at HPNS (Figure 1). All monitoring is being conducted using the requirements of Title 27 of the California Code of Regulations (27 CCR), Section (§) 20921(a)(2) as guidance. This report contains the results of landfill gas and water level monitoring conducted in January, February, and March 2020.

Recent investigations at the landfill, the purpose and scope of the monthly monitoring events, and the organization of this report are discussed below. Additional site background information prior to 2002 is presented in the Final Monthly Landfill Gas Monitoring Report for January 2004 submitted by Tetra Tech EM Inc. (Tetra Tech; 2004a).

Routine monitoring is performed with handheld field equipment that is calibrated for the constituents of concern prior to monitoring. Values of zero that are reported in this report are from the handheld equipment and not from a fixed laboratory and may be skewed low based on limitations of handheld field equipment. However, the detection limit of the handheld field equipment is low enough to correlate to the action levels at the Parcel E-2 landfill and is appropriate for the compliance monitoring being conducted at Parcel E-2.

Construction activities are ongoing as the final remedy is being installed at Parcel E-2. Slight variations in monitoring activities may occur and are explained in subsequent sections of this report.

1.1 *Historical Investigations at the Landfill*

In 2002, the Navy conducted an evaluation to characterize and delineate landfill gas at the Industrial Landfill as part of the nonstandard data gaps investigation at Parcel E (Tetra Tech, 2003). At that time field personnel surveyed ambient air and soil gas and installed gas monitoring probes (GMPs) from which samples have been collected on a weekly and quarterly basis to the present. The 2002 monitoring results indicated that methane, the main component of landfill gas, was present at levels above the lower explosive limit (LEL; 5 percent (%) by volume in air) at the following locations:

- Subsurface areas in the northern portion of the landfill;
- Above ground in ambient air at four areas within the University of California, San Francisco (UCSF) property (herein referred to as “the UCSF Compound”).

Additionally, trace amounts of methane and non-methane organic compounds (NMOCs) were detected in the crawlspace of Building 830 within the UCSF Compound. However, the concentration of NMOCs detected at each of these locations was well below action levels and did not pose a threat to human health (Tetra Tech, 2003). Methane was not detected at any of the GMPs along Crisp Avenue, indicating that landfill gas had not migrated northward beyond the UCSF Compound to Crisp Avenue or non-Navy property.

From summer 2002 through May 2003, the Navy conducted a time-critical removal action (TCRA) to address the levels of methane above the LEL on the UCSF Compound. The goals of the TCRA were (1) to reduce levels of methane within the UCSF Compound to below the LEL of 5%, in accordance with the requirements at 27 CCR §20921(a)(2), and (2) to prevent future migration of landfill gas to the UCSF Compound. A landfill gas control system, which can be operated passively or actively, was installed to achieve the goals of the TCRA. The Draft Landfill Gas Time-Critical Removal Action Closeout Report (Tetra Tech, 2004b) describes these activities in more detail.

From May through November 2003, the Navy continued monitoring at passive vents (PVs) PV-01 through PV-04 (PV-05 was installed after November 2003), at GMP01A through GMP12 along the fence immediately north of the landfill, and at GMP20 and GMP21 along the western edge of the landfill. The draft TCRA closeout report contains a detailed summary of monitoring results, potential migration pathways for landfill gas, and the response actions taken to address the gas migration scenarios, including installation of a grout curtain in selected areas (Tetra Tech, 2004b). On November 4, 2003, landfill gas monitoring and control activities were suspended. These activities were resumed on January 21, 2004, when a contract for continued activities was implemented. In September 2004, the Navy revised the Parcel E boundary, and the Industrial Landfill area was given the designation "Parcel E-2" (current parcel boundaries are shown on Figure 1).

In January 2005, the Navy transferred Parcel A to the City of San Francisco. The monthly report text and figures now designate this area as "Non-Navy Property."

Figure 2 shows the Site Map and Landfill Gas Monitoring Locations.

1.2 Purpose and Scope

This quarterly monitoring report presents and summarizes the evaluation of monitoring data collected in January, February, and March 2020, based on the modified program schedule proposed by the Navy and approved by the Department of Toxic Substances Control (DTSC) on October 20, 2008 (see Section 2.3 below). This report was prepared using the requirements of 27 CCR §20934 as guidance. Specifically, this report provides the following information:

- Concentrations of methane measured at each monitored GMP and within each on-site structure.
- Concentrations of oxygen, carbon dioxide, and NMOCs measured at each GMP and within each on-site structure in the current program.
- The dates and times of monitoring activities, and the barometric pressures, atmospheric temperatures, general weather conditions, probe pressures, and water levels measured or recorded during the monitoring events.
- Names of monitoring personnel, and a brief description of the sampling apparatus and methods employed.
- Documentation of the dates, extraction locations, periods of operation, and any maintenance issues or field work variances related to operation of the landfill gas control system.

The numbering/reference system used in the report text, tables, and figures correlates monitoring results with the corresponding GMPs and other locations monitored, as recorded in the landfill gas and water level monitoring logs (included in Appendix A).

1.3 Report Organization

This report is organized as follows:

Section 1 provides an introduction to, and an overview of, the recent investigations that have occurred at the landfill.

Section 2 presents the overall objectives and methods of the landfill gas monitoring/control program, as well as a brief overview of recent operating conditions.

Section 3 presents the results of the monthly monitoring for landfill gas (including any required follow-up monitoring and/or response actions), as well as additional information relating to probe pressures, water levels, and meteorological data for this period.

Section 4 presents an evaluation of the monthly monitoring results for this quarter.

Section 5 is an overall summary of the monitoring report and current system status.

Section 6 lists the documents used as background references for this report.

Tables and figures follow Section 6, and then the appendices are included, following the figures:

Appendix A presents landfill gas monitoring data for the monthly monitoring events and depth-to-water data for the last month in the reporting period (as recorded on the Landfill Gas Monitoring Logs and Water Level Monitoring Log).

Appendix B provides a summary of other monitoring results (i.e., for landfill cap monitoring wells) for the current monitoring period.

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2 Monitoring Program Objectives and Methodologies

This section discusses the objectives and methodologies of the landfill gas monitoring program at HPNS Parcel E-2.

2.1 Objectives

The objective of monitoring landfill gas is to verify that the landfill gas control system at Parcel E-2 is effectively reducing levels of methane to below the LEL and preventing hazardous levels of landfill gas from migrating to the UCSF Compound and non-Navy property. Title 27 CCR provides standards for monitoring and controlling combustible gases such as methane. Bay Area Air Quality Management District (BAAQMD) Regulation 8, Rule 34, addresses control of NMOC emissions from solid waste disposal sites.

The landfill gas monitoring and control requirements of 27 CCR and BAAQMD Rule 34 apply to landfills operating under state Resource Conservation and Recovery Act (RCRA) permits. These requirements can be applied to older, inactive, or closed landfills if they pose a potential threat to public health and safety or the environment. The applicability or relevance and appropriateness of 27 CCR requirements to the industrial landfill at IR-01/21 are evaluated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. BAAQMD Rule 34 does not regulate the landfill in Parcel E-2. However, both the 27 CCR and Rule 34 requirements were used as guidelines for development and implementation of the Final Interim Landfill Gas Monitoring and Control Plan (MCP) (Tetra Tech, 2004c), pending completion of the final CERCLA remedy for the landfill.

Title 27 CCR §20921 sets forth the following three performance standards for control of landfill gas at closed landfills:

- Concentrations of methane gas must not exceed 1.25% by volume in air (25% of the LEL) within any on-site structure.
- The concentration of methane gas migrating from the landfill must not exceed 5% by volume in air at the property boundary or an alternative boundary approved in accordance with 27 CCR §20925.
- Trace gases (NMOCs) must be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds.

The criteria for the first two requirements are clear, but the third requirement does not identify specific field monitoring limits for trace gas concentrations. As a result, action levels for field monitoring of NMOCs were established based on an evaluation of previous risk assessments and Tetra Tech EM Inc., health and safety criteria (Tetra Tech, 2002). The health and safety criterion limits NMOCs in the breathing zone to 5 parts per million by volume (ppmv). This criterion is applied to on-site structures and utilities that are accessible to workers, and to surface locations in the UCSF Compound where landfill gas has been historically detected including the crawlspace under Building 830.

Previous risk assessments described in the MCP show that subsurface trace NMOCs found in GMPs within the UCSF Compound and along Crisp Avenue do not pose an unacceptable health risk (Tetra Tech, 2004c). An action level of 500 ppmv was established for NMOCs in GMPs. The 5% limit for methane at the property boundary (requirement 2 above) does not apply either to passive vents or to monitoring wells located on the landfill. Passive vents are part of the landfill gas migration control system, and frequently exceed 5% methane by design. Additionally, the 5% limit does apply at the

GMPs, which are located at various distances outside the Gundwall barrier that reduces the outward migration of landfill gas from the trench and passive vents.

The requirements for monitoring and reporting landfill gas, as set forth in 27 CCR, are summarized as follows:

- Perimeter Monitoring Network (§20925): Gas monitoring probes will be located near the site property boundary, with lateral spacing of no more than 1,000 feet and at depths above groundwater and bedrock.
- Structural Monitoring (§20931): The design of the monitoring network will encompass on-site structures, including buildings, basements, manholes, pipelines, and utility vaults. Methods for on-site structural monitoring may include periodic monitoring using either permanently installed probes or gas surveys, or continuous monitoring systems.
- Monitored Parameters (§20932): All gas monitoring probes and on-site structures will be monitored for methane, and for trace NMOCs if required.
- Monitoring Frequency (§20933): At a minimum, quarterly monitoring is required. More frequent monitoring may be required at locations where monitoring results indicate that landfill gas is migrating or is accumulating in structures.
- Reporting (§20934): Results of landfill gas monitoring will be submitted to the California Integrated Waste Management Board (CIWMB) within 90 days, provided compliance levels are maintained. When compliance levels are exceeded, the results must be submitted within 5 days. A letter that describes the nature and extent of the problem and any immediate corrective actions that must be taken to protect public health and safety and the environment will be submitted within 10 days.

Portions of the landfill gas control system, and some of the current monitoring points, are on property that the Navy has transferred to UCSF. Negotiations between the Navy and UCSF regarding the property that contains the landfill gas control system resulted in the creation of an easement that allows the Navy to maintain and monitor its facilities on UCSF property. The easement was finalized on July 21, 2006.

2.2 Monitoring Methodologies

Landfill gas monitoring locations are sampled either monthly or quarterly, as specified in the program schedule for each current monitoring location, to evaluate migration from the landfill and to verify that the landfill gas control system is achieving the regulatory requirements set forth in 27 CCR §20921 and BAAQMD Rule 34. This section briefly discusses the procedures used to monitor landfill gas. The MCP provides a more detailed discussion of monitoring procedures.

A CES-LANDTEC GEM 2000 landfill gas meter was used to monitor concentrations of methane, oxygen, and carbon dioxide; the percentage of the methane LEL; and real-time temperatures and barometric pressures. A calibrated RAE 2000 photoionization detector (PID) was used to monitor NMOCs. A Gilian GilAir air-sampling pump was used to purge the GMPs prior to monitoring. Pressure in the GMPs was measured using a Magnehelic pressure gauge.

Before soil gas readings were recorded at each GMP, pressure was measured using the Magnehelic pressure gauge with a scale of 0 to 10 inches of water. The air pump was then connected to the sampling port of the GMP and used to purge air from the GMP for at least one minute at 3,000 cubic centimeters per minute. After the GMP was purged, the GEM 2000 landfill gas meter was connected to the sampling port. Readings were recorded when the concentration of landfill gas was stable for at least 30 seconds. Background levels of NMOCs were recorded from the PID by recording the ambient air reading before the meter was connected to the sampling port. After the background level of NMOCs was recorded, the PID was connected to the sampling port to measure NMOCs. The

concentration of NMOCs was recorded when the PID indicated a stable value for at least 30 seconds.

Table 1 identifies the personnel conducting the monitoring events and the equipment used during monitoring. Table 2 lists the monitored locations by category.

2.3 Fieldwork Variances

There have been many fieldwork variances as the monitoring and control activity protocols were being established after the TCRA in 2003. Monitoring and control activities began on a consistent basis in January 2004. From that time until August 28, 2004, gas extraction along the landfill gas barrier wall was performed semi-continuously at the points where the highest methane concentrations were observed, PV-02 and PV-03, and occasionally at GMP24 as needed. The control system was operated under non-standardized protocols until the MCP was finalized in August 2004. Several modifications to the initial protocols have been implemented, in accordance with the provisions of the MCP, to refine the program and develop the most effective method of controlling landfill gas in Parcel E-2.

In addition to the procedures implemented in response to the variances described in this section, protocol modifications have included the following:

- From January 27, 2004, to August 28, 2004, active extraction was performed on a semi-continuous basis at PV-02 or PV-03 (24 hours a day for two to three weeks at a time), in an attempt to determine whether continual active extraction was truly necessary to control landfill gas. (As discussed below, several modifications to this approach have been implemented; and in February 2006 it was determined that, as long as a permanent power source is in place, continuous extraction should not be interrupted for reasons other than periodic maintenance.)
- Initially, active extraction was not performed at PV-02 or PV-03 on the day of the monitoring event, due to the concern that this might prevent landfill gas from reaching the PID or the GEM-2000 while other passive vents were being monitored. The procedure was changed in July 2004, when it was determined that this method was not presenting a true snapshot of trench conditions under continuous active extraction (the predominant state of operation).
- The active extraction flow produced by the SVE blower motor initially was controlled by restricting the main inlet valve on the trailer instead of by opening the secondary bleed-off valve. This method created unnecessary vacuum pressure on the intake, and significantly reduced the effectiveness of the extraction system. The operating procedure was changed in July 2004 and the bleed-off valve was utilized, significantly increasing extraction flow rates while reducing stress on the motor.
- From October 2004 through February 2005, active extraction was performed continuously at PV-02 for one full week just prior to the monthly monitoring event. Because of concerns that an extraction schedule limited to one week per month might allow landfill gas to migrate off the site during the time when extraction was not occurring, the active gas extraction schedule was changed in March 2005. The revised protocol called for active gas extraction to be performed for 40 consecutive hours each week.

As documented in the August and September 2004 monthly reports (ITSI 2005a, 2005b), the landfill gas control system was without power from August 28, 2004, through September 28, 2004 due to damage to the electrical service drop caused by workers at the Golden Gate Railroad Museum yard. During this time, the system was passively venting from PV-01, PV-02, PV-04, and PV-05. PV-03 was not vented during this time. A mobile generator was brought on site on September 29, 2004 and was employed as the power source for active extraction until Pacific Gas and Electric (PG&E) power was restored in March 2006. Active gas extraction was resumed at PV-02 on September 29,

2004, and continued until October 7, 2004, along with extraction at GMP24 from September 30, 2004, to October 4, 2004 (ITSI 2005b, 2005c).

Beginning in May 2005, monthly gas monitoring events were conducted following a period of several days when only passive extraction occurred, and just before the active extraction system was activated, so that the data collected represented the presumed worst-case conditions of the extraction schedule. This practice was replaced by the continuous (24 hours a day, 7 days a week) active extraction schedule adopted on February 8, 2006, after it was determined that the 40-hours-per-week active extraction schedule was no longer sufficient to control methane migration to the fence line GMPs, particularly GMP01A and GMP07A. Further discussion of the methane results observed at GMP01A and GMP07A during January and February 2006, and factors which may have contributed to these concentrations, can be found in the Final Monthly Landfill Gas Monitoring Report for December 2006 (ITSI, 2007).

Beginning in October 2005, passive vents PV-01, PV-03, PV-04, and PV-05 were closed off during any active extraction at PV-02, to maximize the efficiency of methane extraction from the interception trench. These vents were re-opened when active extraction was concluded. This practice was discontinued in December 2005 because of concerns that closing the vents may put undue vacuum pressure on the interception trench. The vents are now left open at all times.

In June 2005, PG&E approved a revised power installation plan to provide temporary power for three years, under a permit that could be extended until a final remedy and the resultant power needs for the Parcel E-2 landfill are determined. The temporary plan included installing two power poles, coordinating a power drop and meter installation with PG&E, terminating unused lines and conduits, and removing an existing power pole that was no longer needed. Following Navy approval of the cost proposal for the performance of this work in December 2005, and PG&E approval of the final plan for the installation work in February 2006, the new power poles were installed on February 28, 2006. PG&E made the power connections on March 24, 2006, and power was restored to the active extraction system on March 27, 2006.

At some point between the April 2006 and May 2006 monitoring events, well IR74MW01A was damaged by construction crews working on the non-Navy property (formerly known as HPNS Parcel A) along and north of Crisp Avenue, and water level measurements could not be taken at this well for several months. IR74MW01A was repaired on September 8, 2006.

At some point between 1100 hours on April 16, 2007, and 0730 hours on April 18, 2007, the electrical service drop for the active extraction system was damaged, presumably by high winds. The service drop was spliced and repaired by electrical crews, and active extraction was resumed at 1700 hours on April 19, 2007.

Following a recommendation made by Gino Yekta of the CIWMB, the probe assemblies on all GMPs were modified during the week of April 21–25, 2008, to ensure that a continuous seal was maintained between monitoring events. This was accomplished by replacing the original flex hose connections between the PVC risers and stopcock valves with PVC fittings.

Following discussions during a site visit by DTSC and CIWMB on September 16, 2008, the following changes in GMP monitoring locations and monitoring frequency were proposed by the Navy, and subsequently approved by DTSC on October 20, 2008:

- **Compliance probes:** GMP10, GMP11A, GMP13, GMP14, GMP15, GMP16, GMP32, GMP33, GMP34, and GMP35

The monitoring of these probes has been reduced from monthly to quarterly. These probes have had no methane detections over the life of the monitoring program and, while NMOCs have been detected at significant levels, no NMOC action level exceedances have occurred. As of the June 2011 quarterly event, GMPs 17 through GMP21, and GMPs 27 through GMP31 have been replaced by GMP33, GMP34, and GMP35. These replacement probes will be monitored quarterly.

- **Probes with recent detections: GMP01A, GMP07A, and GMP22**

The monitoring of these probes has been reduced from monthly to quarterly. GMP01A and GMP07A had methane levels above the regulatory level of 5% in January/February of 2006, while GMP22 had an NMOC level above 100 ppmv in September 2008.

- **Probes with no methane detections: GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, GMP12, GMP25, and GMP26**

The monitoring of these probes has been discontinued. These probes have had no methane detections over the life of the monitoring program, and no NMOC detections above 10 parts per million have been reported.

- **Probes with recurring methane detections: GMP08A, GMP23, and GMP24**

The monitoring of these probes is continuing monthly. These probes historically have had recurring methane detections, although only GMP24 has had action level or regulatory exceedances.

The October 2008 monitoring event was the first monthly event performed under this modified program schedule. The first quarterly monitoring event under the reduced list of locations was performed in December 2008. Quarterly events now are conducted during the last month of each calendar quarter (i.e., March, June, September, and December).

On Tuesday, February 17, 2009, following a significant storm event, it was discovered that the electrical service drop for the landfill gas active extraction system had been damaged, rendering the active extraction system inoperable. The service drop was replaced on Friday, February 20, 2009, and active extraction was not resumed until after the monthly monitoring event was completed, in order to assess the worst-case conditions at the monitoring probes. As an additional precaution, GMP01A and GMP07A were included in the February 2009 monitoring event, as these two locations have had exceedances in the past and are the probes most likely to be influenced negatively by the lack of active extraction on the collection trench. All methane detections during this event were below the 2.5% HPNS action level.

At approximately 0500 hours on April 14, 2010, power to the active extraction system was interrupted by PG&E crews working along Crisp Avenue. As an additional precaution, GMP01A and GMP07A were included in the April 2010 monitoring event, as these two locations have had exceedances in the past and are the probes most likely to be influenced negatively by the lack of active extraction on the collection trench. All methane detections during this event were below the 2.5% HPNS action level. Power was reinstated and active extraction resumed at 0930 hours on April 15, 2010.

Except for GMP32, all of the Crisp Avenue GMPs and groundwater monitoring locations (GMP13, GMP14, GMP15, GMP16, GMP17, GMP18, GMP19, GMP27, GMP28, GMP29, GMP30, GMP31, and IR74MW01A) were removed by sewer line removal trenching activities on Crisp Avenue in 2010. These probes were replaced on June 29-30, 2011, by GMP33, GMP34, and GMP35, which were installed to specifications prescribed by the MCP, and incorporated suggestions from the California Department of Resources, Recycling, and Recovery—Closure & Facility Engineering Unit. In addition, water level monitoring locations IR01P03AA and IR01P03AB have been pressure-grouted by the basewide well decommissioning contractor, and are therefore no longer monitored.

At some point between 1300 hours on March 20, 2015, and 0800 hours on March 23, 2015, the electrical line to the active extraction system was severed, presumably by vandalism. The line was repaired and maintenance was performed on the unit. Active extraction resumed at 1500 hours on March 26, 2015.

Due to perimeter road installation, the active extraction unit was removed from service for the month of August 2017. After construction improvements, the extraction unit was placed back into service.

The HPNS meteorological tower was removed from service in April 2018. Weather data is obtained from the National Climatic Data Service archives for the San Francisco Airport, accessible at:

<http://www.ncdc.noaa.gov/cdo-web/search> or <http://www.wunderground.com>

Active gas extraction has been on-going (running continuously without interruption) at PV-02 since April 15, 2010. During the current monitoring period, the active gas extraction conducted at PV-02 was performed for the durations noted below:

- January 2020 Operations: 744 hours
- February 2020 Operations: 696 hours
- March 2020 Operations: 744 hours
- **Total Quarterly Operations: 2,184 hours**

2.4 Data Evaluation

Results of landfill gas monitoring were evaluated against the performance standards and action levels for methane and NMOCs outlined in the MCP. These are based on the performance standards set forth in 27 CCR and BAAQMD Rule 34. Section 3 of this report summarizes the results of landfill gas monitoring during this reporting period.

2.5 Deviations

It was determined at the November/December 2006 Base Realignment and Closure Cleanup Team (BCT) meeting that while monthly monitoring at HPNS Parcel E-2 remained appropriate, formal reports were needed less frequently. Therefore, it was agreed that, under current conditions, the Final Monthly Landfill Gas Monitoring Report for December 2006 (ITSI, 2007a) would be the last formal monthly report. Also agreed was starting in January 2007, monthly monitoring and BCT presentations would continue but formal reports only would be issued quarterly.

It was further determined at the July 2007 BCT meeting that the quarterly reports would be submitted only as final reports. The first quarterly report submitted as such was issued in October 2007 and covered the third quarter of 2007. Final quarterly reports have been issued for each subsequent calendar quarter.

As discussed in Section 2.3 above, reductions in GMP monitoring locations and frequency were proposed by the Navy following discussions during a site visit by representatives of DTSC and CIWMB on September 16, 2008 and were approved by DTSC on October 20, 2008.

3 Monitoring Results

This section presents the results of monthly monitoring measurements recorded at the landfill during January and February of 2020, and the quarterly monitoring measurements from March 2020. This report also includes depth-to-water readings taken on March 12, 2020. Appendix A contains Landfill Gas measurement data and Water Level measurement data for this monitoring period. Appendix B summarizes the results of landfill gas monitoring at locations other than those specified in the MCP. These locations (specifically, the groundwater monitoring wells on the landfill cap) are being monitored quarterly to evaluate the presence of methane in the landfill relative to methane concentrations observed in the GMPs. Documenting the fluctuation of methane levels observed in the landfill wells over time also helps to demonstrate the wide variability of methane presence with respect to seasonal conditions such as temperature and groundwater elevation.

3.1 Methane Results

This section summarizes the results of methane monitoring during this reporting period. The results for methane (excluding passive vents and the wells listed in Appendix B) are shown on Figure 3 and Figure 4. Methane results for each MCP-specified location monitored for the three sampling events are located in Appendix A. Note that all methane concentrations are reported as percentage of methane by volume.

The subsections below present the results for monitoring locations in the following areas:

- **Fence Line** (between the landfill and the UCSF Compound);
- **UCSF Compound**;
- **Crisp Avenue**;
- **Structural Locations**;
- **Ambient Air Locations**; and
- **Control System** (for landfill gas).

The fence line between the landfill and the UCSF Compound is considered the property boundary for the landfill gas monitoring program (Tetra Tech, 2004c), which is of significance for reporting the monitoring results consistent with Title 27 CCR §20921 (see Section 2.1 above).

3.1.1 Fence Line

Methane concentrations measured at the fence line sample locations along the northwestern and northeastern perimeter of the landfill represent methane concentrations of soil gas migrating beyond the site boundary. These locations (GMP01A, GMP07A, GMP08A, GMP10, GMP11A, GMP20, and GMP21) are specified in the modified monitoring program discussed in Section 2.3. One location (GMP01A), had a measurable level of methane at 6.4%, while all other sample locations along the fence line had non-detectable methane concentrations during this monitoring period. As a result, plans were made to implement additional active extraction and treatment at PV-05 and initiate daily monitoring until methane levels return to acceptable levels. Prior to starting up the second treatment unit at PV-05, additional monitoring results were taken at GMP01A on April 23, 2020 and April 30, 2020 (see Table A-5, Appendix A).

- *The regulatory performance standard of less than 5% methane by volume and the HPNS site action level of 2.5% were both exceeded at location GMP01A.*
- *All but one of the concentrations measured at the GMP sampling locations along the fence line were below the regulatory performance standard and the HPNS site action level for this monitoring period. The methane concentration measured in GMP01A was 6.4%, so it exceeded both the regulatory performance standard and the HPNS site action level.*

Figures 3 and 9 show methane results along the fence line, and Appendix A provides the methane data for these GMP locations. GMP10 and GMP20 were inaccessible during this monitoring period due to ongoing construction activities to install the final remedy.

3.1.2 UCSF Compound

GMPs monitored within the UCSF Compound (GMP22, GMP23, and GMP24) represent an area between the boundary of the landfill and the compliance probes on Crisp Avenue. GMP23 (0.2%) and GMP24 (0.3%) had detectable, but low, levels of methane, while the measurement at GMP22 did not detect any methane.

- *The regulatory performance standard of less than 5% methane by volume and the HPNS site action level of 2.5% were therefore met at all UCSF GMPs for all monitoring events during the monitoring period.*

Appendix A provides the methane measurement data at the GMPs in the UCSF Compound.

3.1.3 Crisp Avenue

All of the sampling locations along Crisp Avenue (GMP32, GMP33, GMP34, and GMP35) are only scheduled to be monitored quarterly. None of the measurements taken on March 12, 2020 registered detectable level of methane.

- *The regulatory performance standard of less than 5 percent (%) methane by volume and the HPNS site action level of 2.5% were therefore met at all locations.*

Appendix A provides the methane measurement data at the GMPs along Crisp Avenue.

3.1.4 Structural Locations

Monitoring for methane was performed in the crawlspace at Building 830 within the UCSF compound and at the remaining on-site utilities locations (catch basins DP1 and DP2). None of the methane readings at these locations showed detectable levels.

- *The regulatory performance standard of less than 1.25 percent (%) methane by volume in air (25% of the LEL) within on-site structures was met.*

These structural locations are being monitored by the Navy because of their close proximity to the landfill. Figure 4 shows the methane monitoring results for these locations and Appendix A provides methane measurement data at the structural locations.

3.1.5 Ambient Air Locations

In accordance with MCP guidelines, three ambient air locations within the UCSF compound (Ambient Location A [fence line], Ambient Location B [basketball court], and the light pole) were removed from the monitoring program in 2006, based on the ongoing absence of methane or NMOC detections at these locations. However, if active gas extraction is interrupted for an extended period of time (i.e., more than one week), or if methane or NMOCs are detected at other locations within the UCSF compound at levels higher than those observed in the recent past, monthly monitoring will be resumed at these ambient locations.

3.1.6 Control System

During the current monitoring event, concentrations of methane at the landfill gas control system locations (PV-01 through PV-05) were measured on March 12, 2020. Three measurements were taken at each location: "influent" (soil gas coming directly from the landfill), "carbon1" (effluent from the first carbon vessel), and "hydrosil" (effluent from the last vessel of the filter system). Rust holes were noted in one carbon canister at each of two locations (PV-04 and PV-05). Swap out of canisters were initiated for both locations.

- *Measured methane concentrations ranged from a high of 63.6% by volume in the influent sample at the PV-01 location to 0.0% from the hydrosil sample port at all locations.*

Appendix A provides complete methane monitoring results for the control system sample locations

3.2 Non-Methane Organic Compound Results

During the January-March 2020 monitoring period, NMOCs were measured concurrently with methane measurements at all locations. Results of these measurements are presented in the tables provided in Appendix A and Appendix B and summarized below. Figures 5, 6, and 7 present the historical results for NMOCs in GMPs at the fence line, within the UCSF compound, and along Crisp Avenue, respectively, for each monitoring event from October 2018 through March 2020.

- **Fence Line.** Only 5 of 7 sampling locations were accessible for measurements. GMP08A had a positive reading (0.1 ppmv) for MNOCs in March 2020, but not for January or February. All other fence line measurements were non-detect for this monitoring period. (The action level is 500 ppmv).
- **UCSF Compound.** The current field measurement at GMP22 was a non-detect, while the measurements for NMOCs at GMP23 ranged between 0.0 ppmv and 0.8 ppmv, and at GMP24 ranged between 0.0 ppmv and 0.3 ppmv. (The action level is 500 ppmv).
- **Crisp Avenue.** None of the measurements taken at the Crisp Avenue sampling locations had detectable NMOC levels; all were in March 2020. (The action level is 500 ppmv).
- **Structural Locations.** All of the structural location measurements were non-detect; also collected only in March 2020. (The action level for these locations is 5 ppmv).
- **Ambient Air Locations.** No ambient air samples were collected during the current monitoring period.
- **Control System.** There are 5 vent monitoring locations (PV-01, PV-02, PV-03, PV-04, and PV-05), and each location has three distinct sample points (at the influent, after the first carbon canister, and at the effluent sampling port, i.e. the hydrosil canister outlet). These locations are only sampled once per quarter, and for this period it was March 12, 2020. With the exception of 2 influent sampling points, all measurements were non-detect for NMOCs. The measureable values were 1.5 ppmv (PV02) and 0.8 ppmv (PV04). (The action level for these monitoring points is 100 ppmv for the outlet of, or effluent from, the control system).

Due to a previous problem with the PID pump (described in Section 3.2 of the March 2006 Monthly Report [ITSI, 2006]), pre-monitoring and post-monitoring field checks of PID vacuum pressure are performed along with the regular field calibrations, to verify that the instrument's pump is functioning properly. For each monitoring event during the current monitoring period, it was determined that the PID was creating sufficient vacuum to generate accurate readings. A calibrated Mini-RAE 2000 PID was used to attain the NMOC readings. The PID is serviced quarterly, regardless of instrument performance, to prevent any further problems. Quarterly servicing of the PID was performed prior to this monitoring event and will be performed before the next scheduled monitoring event.

- *During this monitoring period, NMOCs were only detected at a handful of locations, and at very low levels in one Fence Line location, two UCSF Compound locations, and the influent of two control system locations (PV-02 and PV-04). NMOC concentrations at all sampling locations were below the applicable Hunters Point action level. Since all NMOC concentrations were below the corresponding HPNS NMOC action levels, no further action or follow-up monitoring was necessary during this monitoring period.*

When NMOC data indicate that a PV location is approaching saturation (consistent rise in NMOC results), the drum may be replaced as a precautionary measure by moving the second-position (effluent) carbon drum to the first position and placing a new carbon drum in the second position.

(The second carbon drum is present at each passive vent to further reduce the amount of NMOCs emitted to the environment by venting from the extraction system.) The carbon and hydrosil (potassium permanganate) drums also may require occasional replacement due to corrosion of the drum exteriors after several years in operation. The drums were inspected on March 12, 2020 and single drums at locations PV-04 and PV-05 were found to have a rust hole on the drum top. As a result, drum replacement for these locations was initiated.

3.3 Trace Gas Results

Oxygen is not regulated under 27 CCR or BAAQMD Rule 34, but this parameter is monitored because low concentrations of oxygen in soil may be associated with landfill gas. During this monitoring period oxygen concentrations in all GMPs monitored within the UCSF compound and the GMPs along the fence line ranged from well below to slightly below the standard atmospheric concentration of 20.9 percent. Oxygen values in these areas during routine monitoring ranged from 0.0 to 16.0 percent by volume in the UCSF compound GMPs, and from 0.6 to 13.3 percent by volume along the fence line. Low-oxygen conditions are consistent with influence from the Parcel E-2 landfill. Appendix A presents the monitoring results for oxygen during the monitoring period.

Carbon dioxide is not regulated under 27 CCR or BAAQMD Rule 34, but carbon dioxide concentrations generally are elevated where landfill gas is present. During the monitoring period, carbon dioxide concentrations in the GMPs closest to the landfill (i.e., those along the fence line and in the UCSF compound) ranged from 4.8 to 20.0 percent by volume, with all locations above the standard atmospheric concentration of approximately 0.04 percent (400 ppmv). Carbon dioxide concentrations at probe locations on Crisp Avenue, which are farther away from the landfill, ranged from 0.3 to 4.1 percent by volume. Carbon dioxide monitoring results are presented in Appendix A.

3.4 Probe Pressures

Measurement of air pressure at the GMPs helps assess whether landfill gas is accumulating, and can provide information about the influence of the extraction system on mitigating any increases in the presence of landfill gas. During this monitoring period, gauge pressure at the GMPs (pressure in the probes relative to atmospheric pressure) was measured using a Magnehelic pressure gauge. Pressure was measured at 0.0 inches at all GMPs monitored during this period. Appendix A presents the probe pressure readings recorded at GMPs during these events.

3.5 Water Levels

Water level measurements are recorded primarily to confirm that the bottom of the landfill gas barrier wall is below the top of the saturated zone, thus preventing landfill gas from migrating underneath the barrier wall. Water level measurements also provide information about the thickness of the vadose zone, as the lower boundary of the vadose zone is determined by the elevation of the water table.

On March 12, 2020, water levels were measured at twelve locations consisting of groundwater monitoring wells, piezometers, and gas monitoring probes. IR01P04A was inaccessible during this monitoring period due to ongoing construction activities associated with the installation of the final remedy. Water levels were measured as depths below the tops of well casings. Subsequently, these measurements were converted to depths below ground surface and to elevations relative to mean sea level (msl) using the surveyed elevations for these locations. Appendix A shows the measured water levels and the converted values for this event.

Groundwater generally flows to the east and southeast, from the non-Navy property north of Parcel E-2 toward San Francisco Bay and to a groundwater sink near the northern end of the boundary between Parcels D and E. The water level readings collected during this monitoring event indicate that the bottom of the barrier wall, which ranges in elevation from -1.2 feet msl (i.e., 1.2 feet below msl) to 1.9 feet msl, was submerged below the water table at all locations monitored.

As discussed in greater detail in Section 4, there appears to be an inverse relationship between methane concentrations and groundwater elevations at GMP24 (which historically tends to be the GMP with the highest methane concentrations). In general, the lower the groundwater elevation near GMP24 the higher the methane concentration at GMP24. Figure 8 illustrates this relationship.

3.6 Meteorological Data

Meteorological data are used qualitatively to evaluate whether changes in weather affect the behavior of landfill gas. For example, a rapid decrease in barometric pressure may affect the amount of landfill gas that is released, and temperature may affect the rate of landfill gas generation. In addition, precipitation and the elevation of the water table influence the volume of the vadose zone, and may influence the potential buildup of pressure behind submerged probe screens.

The HPNS meteorological tower was removed from service in April 2018. Weather data is obtained from the National Climatic Data Service archives from the closest monitoring location at the San Francisco Airport. Record data include wind speed, wind direction, air temperature, relative humidity, precipitation, dew point, and barometric pressure.

Tables 3a, 3b, and 3c present the daily meteorological data collected for January, February, and March, 2020, respectively. All daily meteorological data are averages of hourly data except daily precipitation, which is the sum of hourly precipitation data, and cumulative precipitation, which is the season-to-date total at the end of each day.

Table 4 summarizes monthly meteorological data from October 2018 through March 2020. All monthly meteorological data are averages of hourly data except monthly precipitation, which is the sum of hourly precipitation data, and cumulative precipitation, which is the season to-date total at the end of each month.

Concentrations of methane may be affected by atmospheric variations, although other factors (e.g., groundwater elevation, soil saturation, or changes in the operation of the extraction system) may overshadow any such effects. Figures 9 and 10 illustrate the daily barometric pressures and observed methane concentrations for each day that methane was monitored at GMPs at the fence line and within the UCSF compound. Similarly, figures 11 and 12 illustrate the daily temperatures and the observed methane concentrations at the same GMPs. Long-term (seasonal) effects on GMPs appear to influence the presence of methane, as further discussed in Section 4.

4 Evaluation of Results

The primary objective of landfill gas monitoring at HPNS Parcel E-2 is to verify that the landfill gas control system is effective in preventing migration of landfill gas to the UCSF compound and adjacent non-Navy property. Monitoring locations include GMPs, the crawlspace at Building 830, the on-site utilities, and the landfill gas control system.

During this quarterly monitoring period, there was one methane exceedance along the barrier wall and extraction trench at monitoring location GMP01A on March 12, 2020. Since regular monitoring was initiated in January 2004, activation of the active gas extraction system at GMP24 has been required on twenty-four occasions when methane concentrations at GMP24 have met or exceeded the project action level. In most of the instances for which concurrent groundwater and landfill gas data are available, the groundwater table in the area between IR01MW05A and GMP32 was less than 5.5 feet msl (see Figure 8 for correlation between UCF compound GMPs and water levels). One possible explanation for these elevated dry-season detections of methane is that lower groundwater levels, when combined with a dry and therefore less-constricted vadose zone, permit greater gas flow in the subsurface in this area. Monthly monitoring data are reviewed on an ongoing basis to identify possible seasonal and other influences on gas migration.

During this monitoring period, only one methane, and no NMOC concentrations were detected above the regulatory action level by the field monitoring instruments. This was true for all GMP locations (except for GMP01A) monitored this quarter. However, the one exceedance of the corresponding action level, caused additional active venting action to be implemented and follow-up monitoring became necessary as well.

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5 Summary

Landfill gas monitoring and water level measurement activities took place in January, February, and March, 2020.

Title 27 CCR limits concentrations of methane gas to:

- 5 percent by volume at the site boundary and
- 1.25 percent by volume in on-site structures.

All methane results during the monitoring period (except at GMP01A) were below the corresponding methane action levels. However, this one exceedance caused additional active venting and treatment to be implemented and follow-up monitoring also became necessary.

The action levels for NMOCs (established based on an evaluation of previous risk assessments and health and safety criteria [Tetra Tech, 2002]) are:

- 500 ppmv in GMPs;
- 5 ppmv within Building 830;
- 5 ppmv in on-site utilities;
- 5 ppmv in ambient air (recorded in the breathing zone); and
- 100 ppmv for two consecutive days from a control system outlet.

All NMOC results during the monitoring period were below the corresponding NMOC action levels; therefore, no action or follow-up monitoring was necessary due to NMOC concentrations during this period.

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6 References

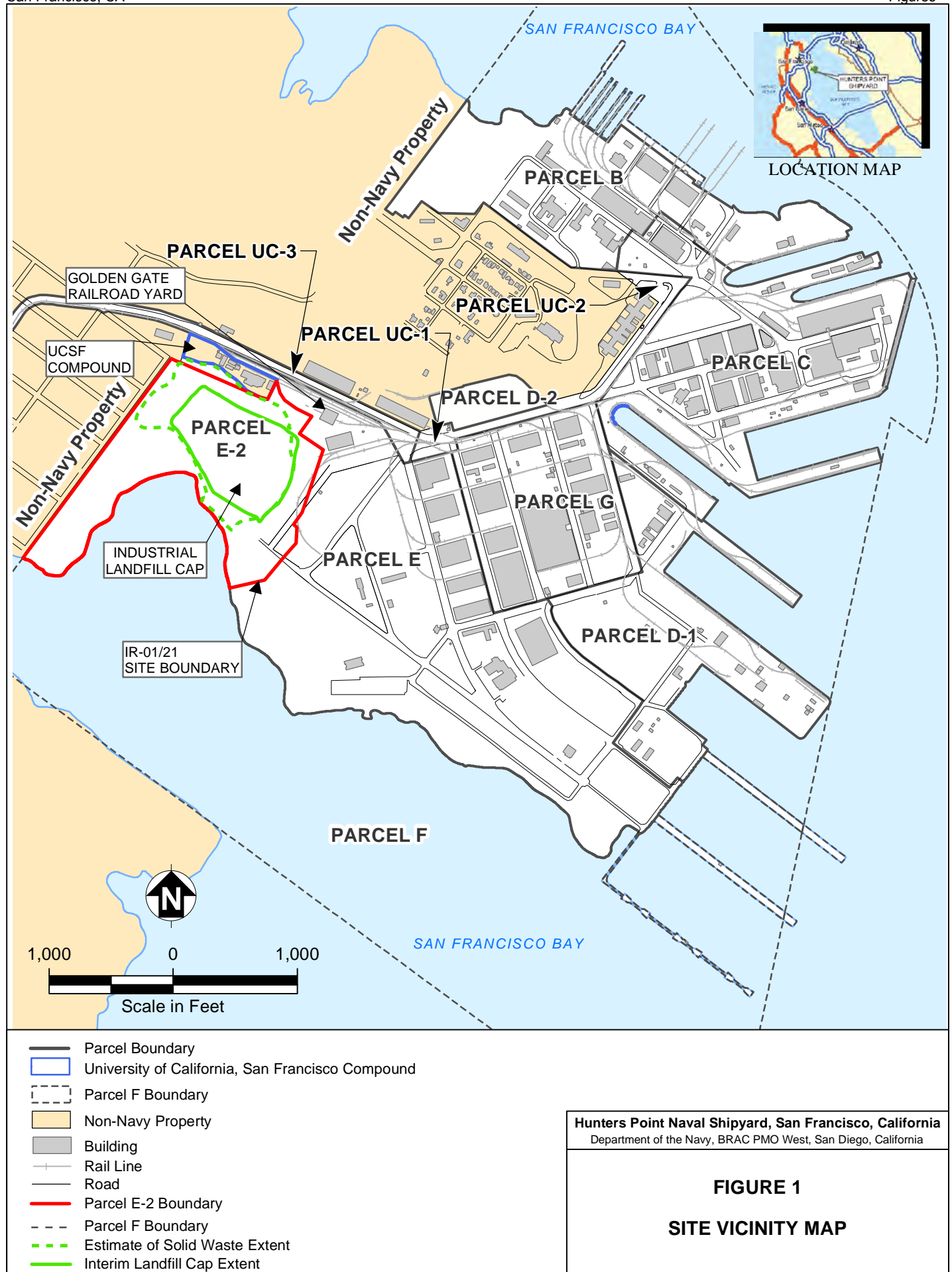
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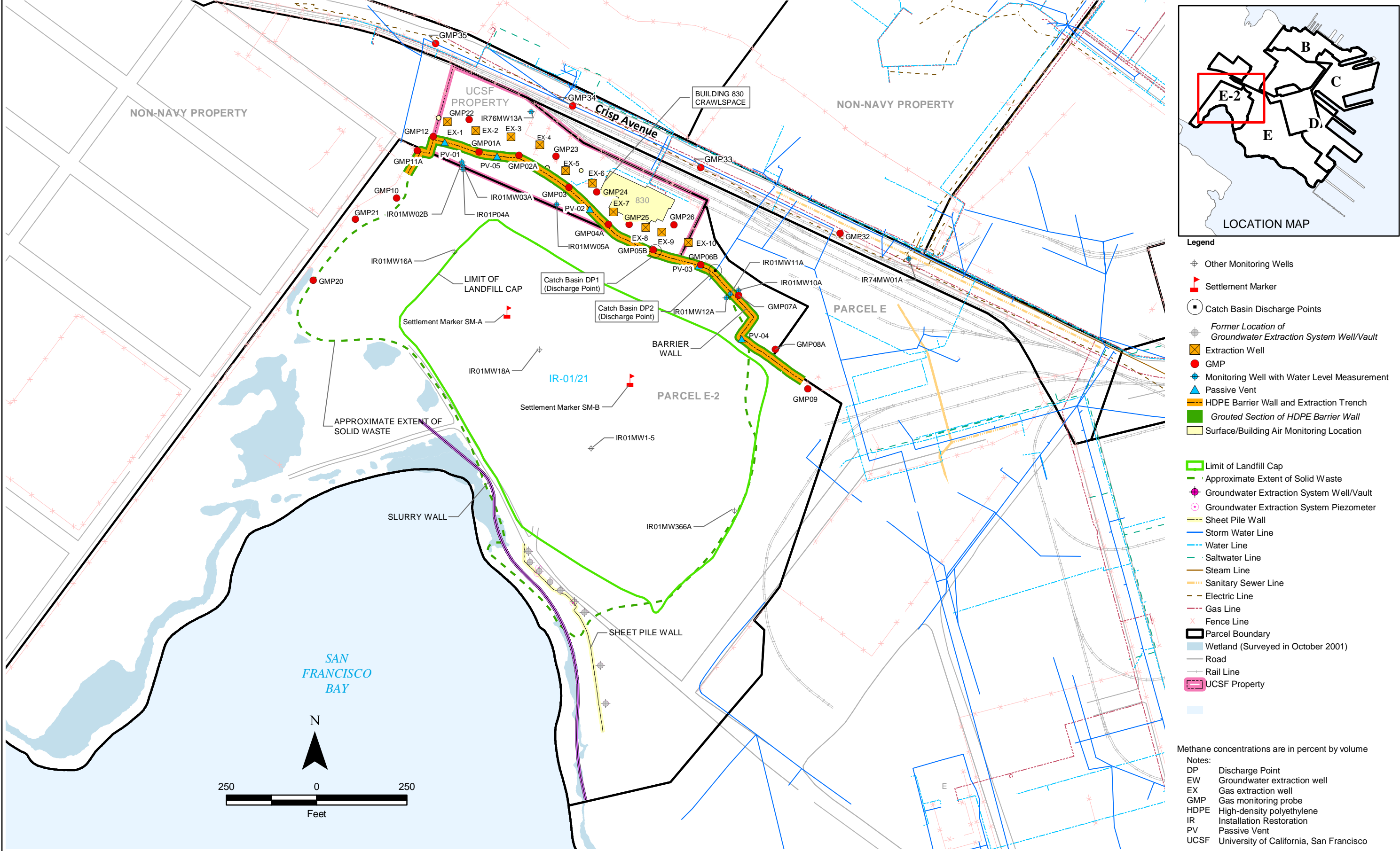
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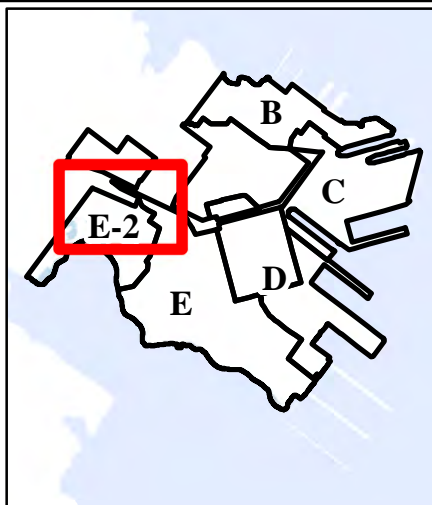
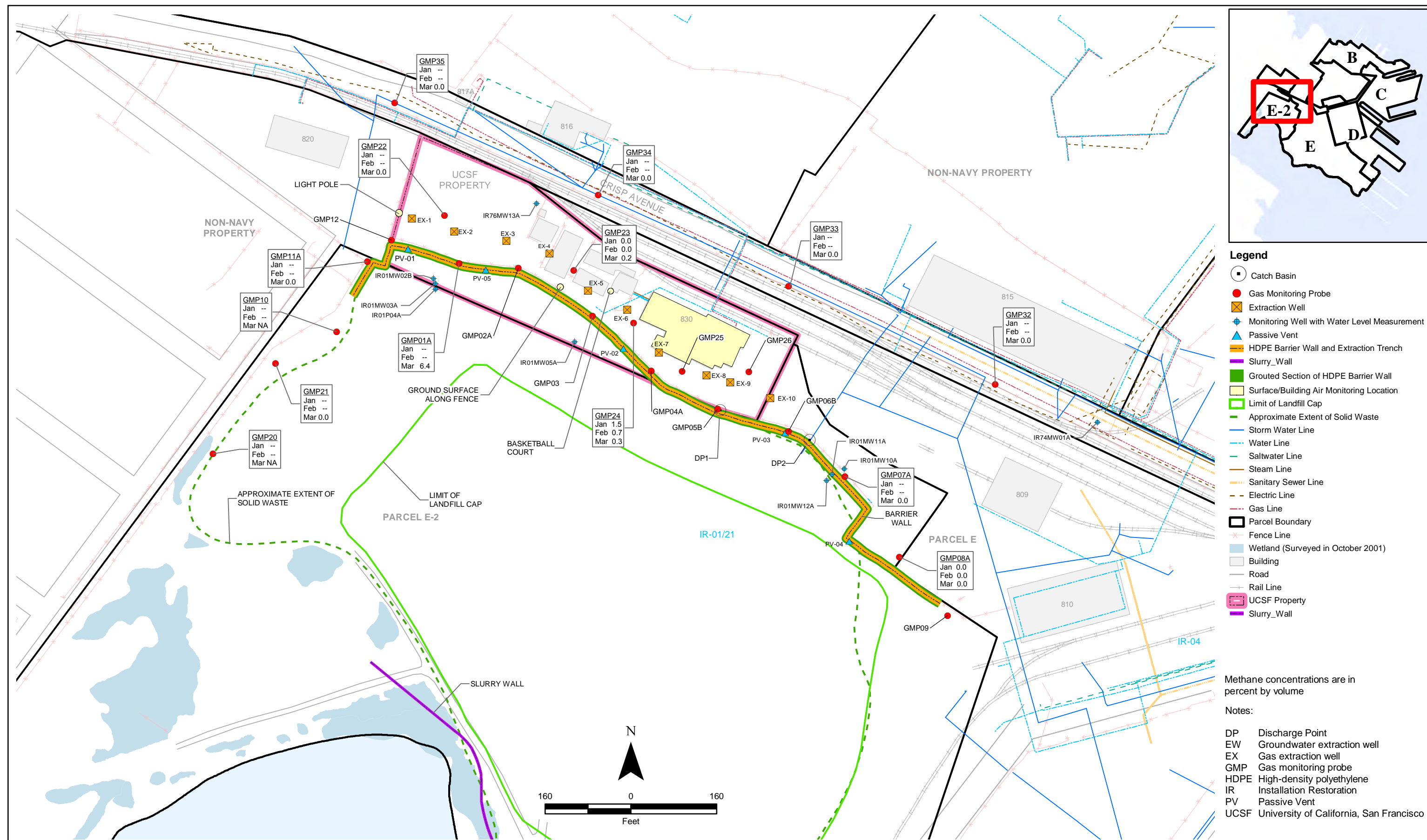
FIGURES

Figure 1	Site Location Map
Figure 2	Site Map and Landfill Gas Monitoring Locations
Figure 3	Methane Concentrations at GMPs
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Figure 5	NMOC Concentrations for GMPs at the Fence Line
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Figure 7	NMOC Concentrations for GMPs on Crisp Avenue
Figure 8	Methane Concentrations and Groundwater Elevations near GMP23 and GMP24
Figure 9	Methane Concentrations and Barometric Pressures for GMPs at the Fence Line
Figure 10	Methane Concentrations and Barometric Pressures for GMPs at the UCSF Compound
Figure 11	Methane Concentrations and Temperatures for GMPs at the Fence Line
Figure 12	Methane Concentrations and Temperatures for GMPs at the UCSF Compound

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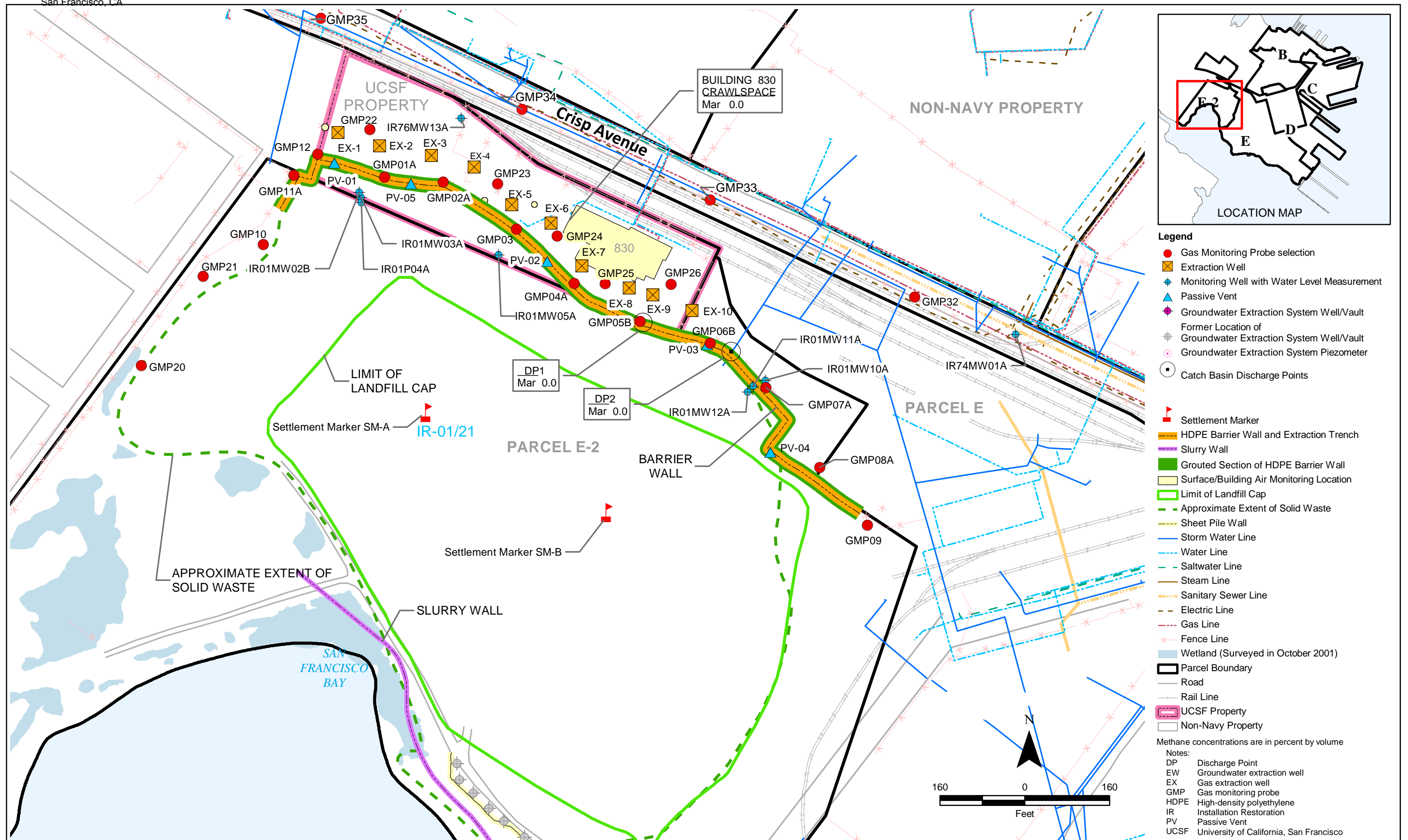






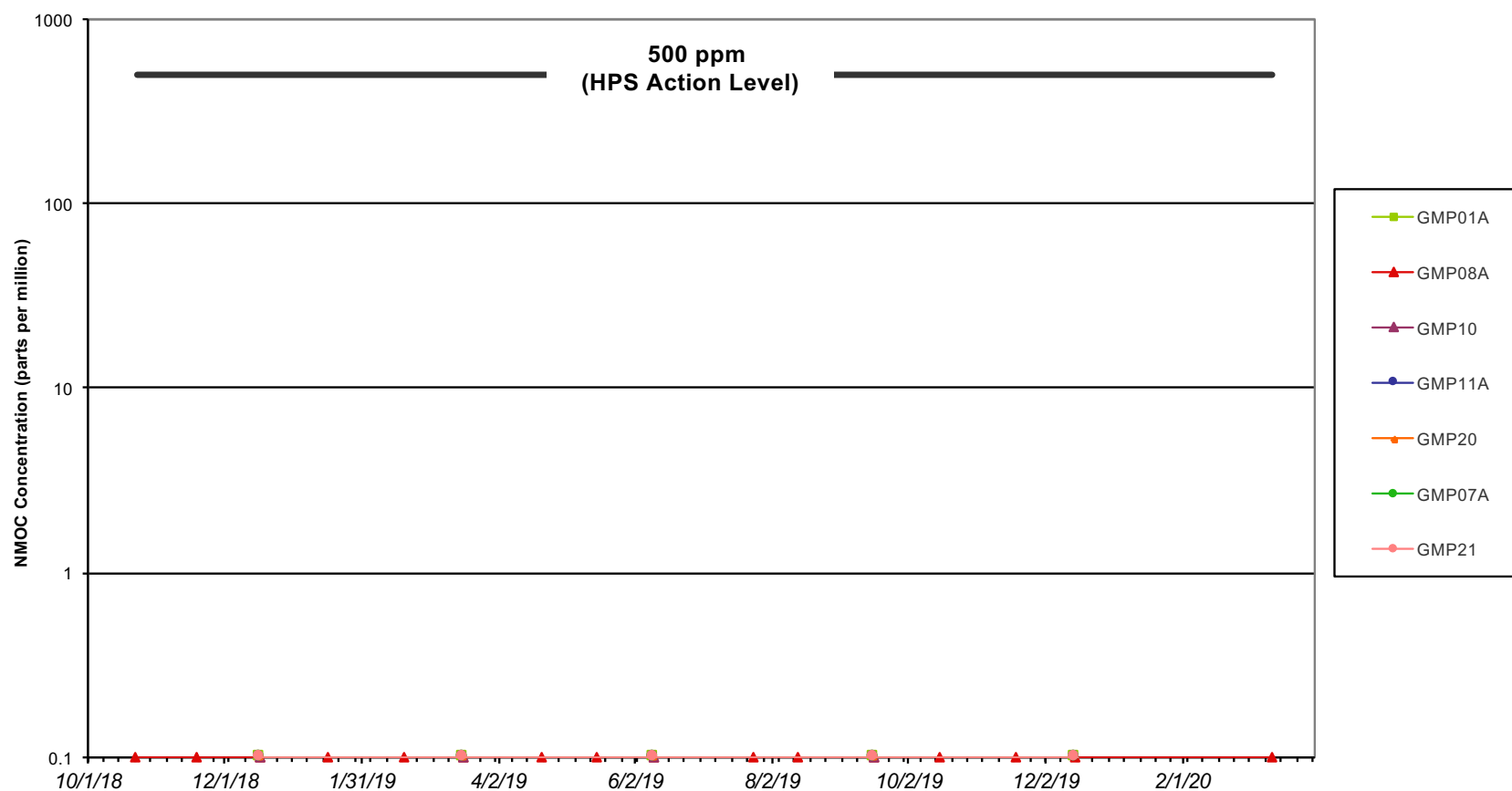
Quarterly Landfill Gas Monitoring Report
Hunters Point Naval Shipyard
San Francisco, California

FIGURE 3
Methane Concentrations at GMPs
January - March 2020



Quarterly Landfill Gas Monitoring Report
Hunters Point Naval Shipyard
San Francisco, California

FIGURE 4
Methane Concentrations at Structural Locations
March 2020

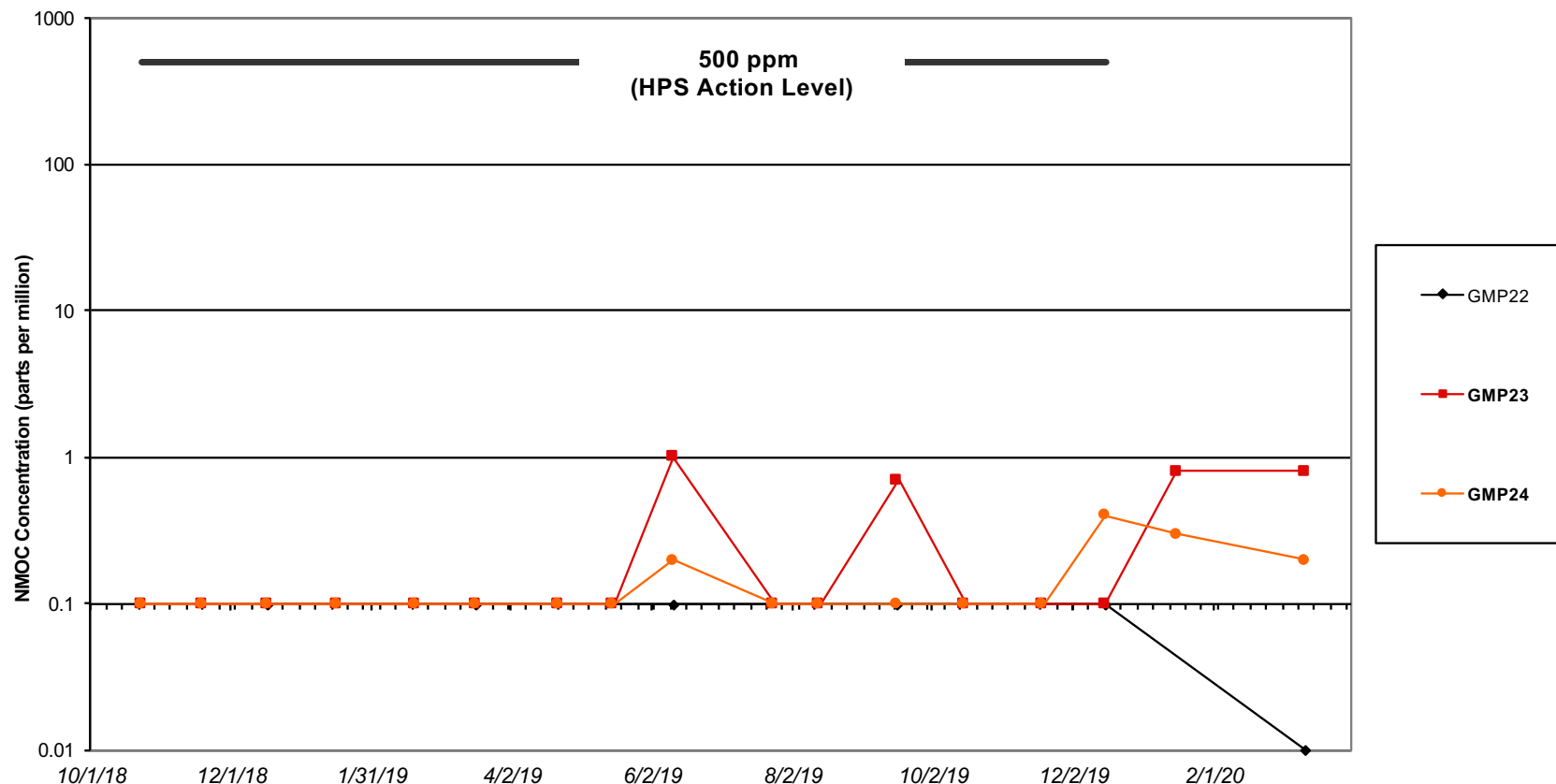


Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, monitoring has been discontinued at the following Fence Line locations: GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, and GMP12. Monitoring at GMP08A will continue monthly, while all other Fence Line locations will be monitored quarterly (see Section 2.3 of the report text). GMPs with NMOC detections during the indicated interval are shown with legend entries in bold. Periods of active gas extraction are specified in Section 2.3.1 of the report text.

GMP Gas monitoring probe
NMOC Non-methane organic compound

Hunters Point Naval Shipyard, San Francisco, CA
U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 5
NMOC Concentrations for
GMPs at the Fence Line
October 2018 - March 2020

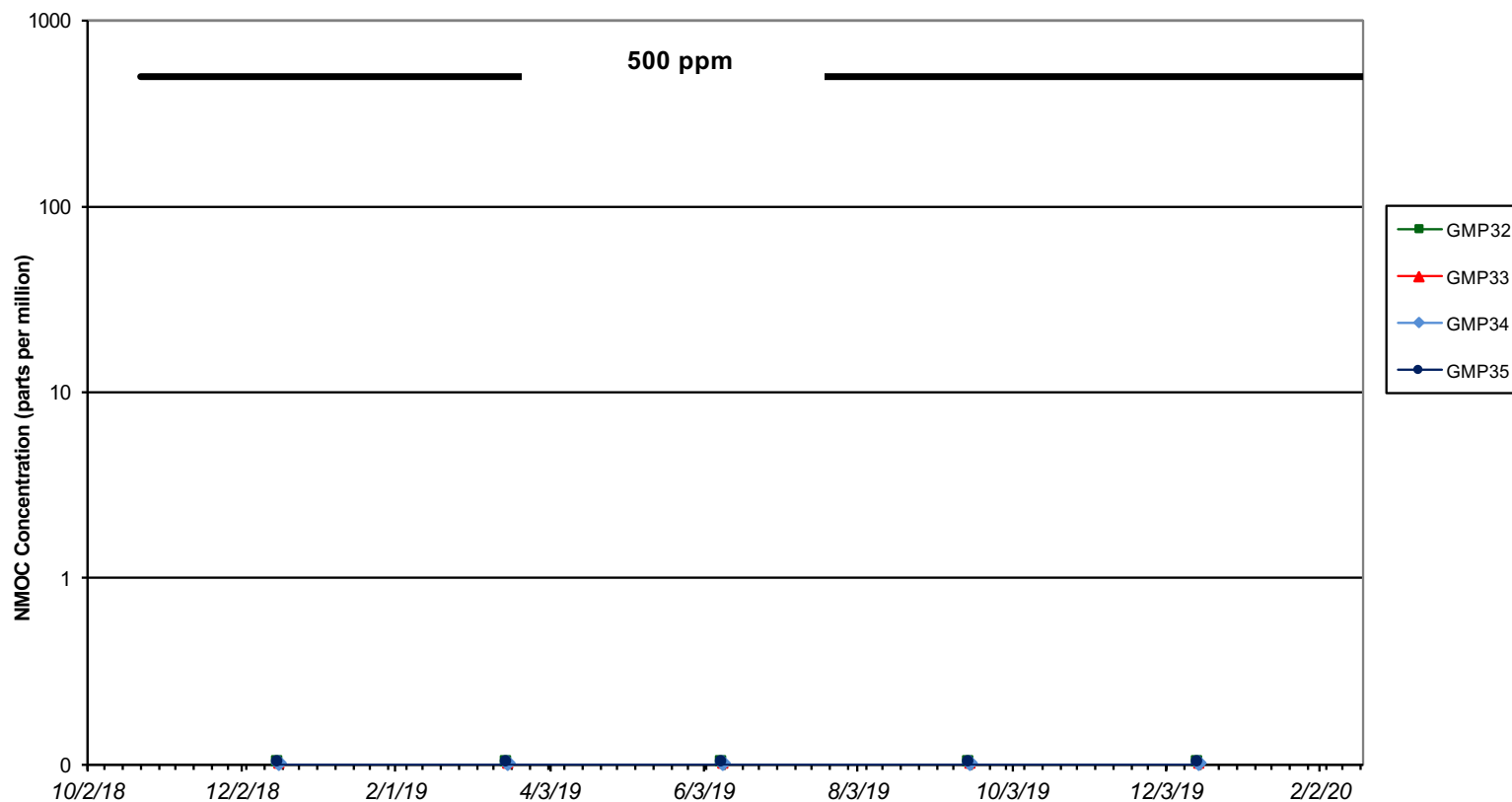


Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, monitoring has been discontinued at the following UCSF locations: GMP25 and GMP26. Monitoring at GMP23 and GMP24 will continue monthly, while GMP22 will be monitored quarterly (see Section 2.3 of the report text). GMPs with NMOC detections during the indicated interval are shown with legend entries in bold. Periods of active gas extraction are specified in Section 2.3.1 of the report text.

GMP Gas monitoring probe
NMOC Non-methane organic compound
UCSF University of California, San Francisco

Hunters Point Naval Shipyard, San Francisco, CA
U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 6
NMOC Concentrations for
GMPs at the UCSF Compound
October 2018 - March 2020



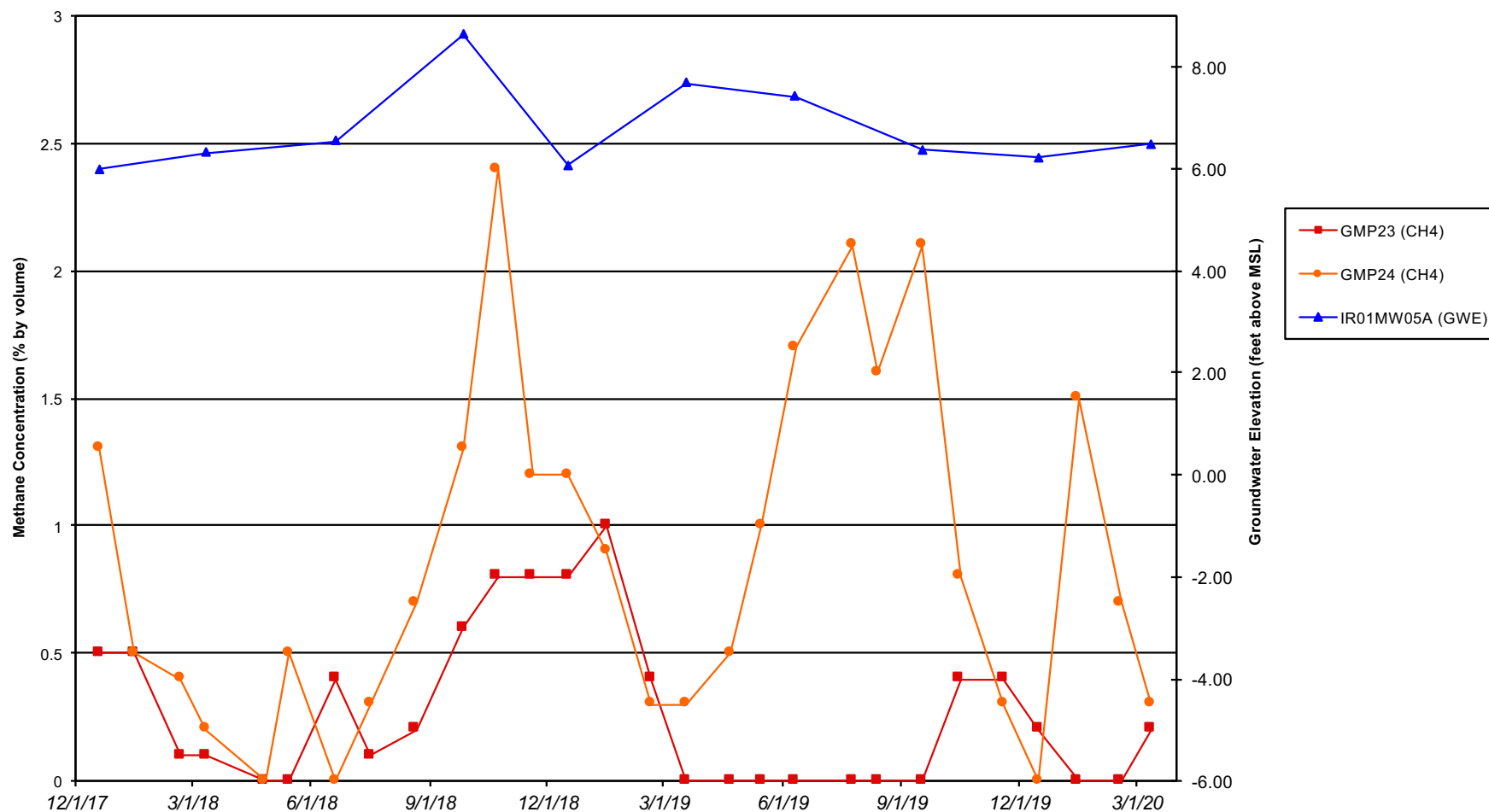
Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, all Crisp Avenue locations will be monitored quarterly rather than monthly (see Section 2.3 of the report text).
GMPs with NMOC detections during the indicated interval are shown with legend entries in bold.
Periods of active gas extraction are specified in Section 2.3.1 of the report text.
GMP32 was temporarily inaccessible due to trenching activities, and was not monitored from September 2010 through January 2011. June 2011 was the first monitoring event including GMP33, GMP34, and GMP35.

GMP Gas monitoring probe
NMOC Non-methane organic compound

Hunters Point Naval Shipyard, San Francisco, CA

U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 7
NMOC Concentrations for
GMPs on Crisp Avenue
October 2018 - March 2020

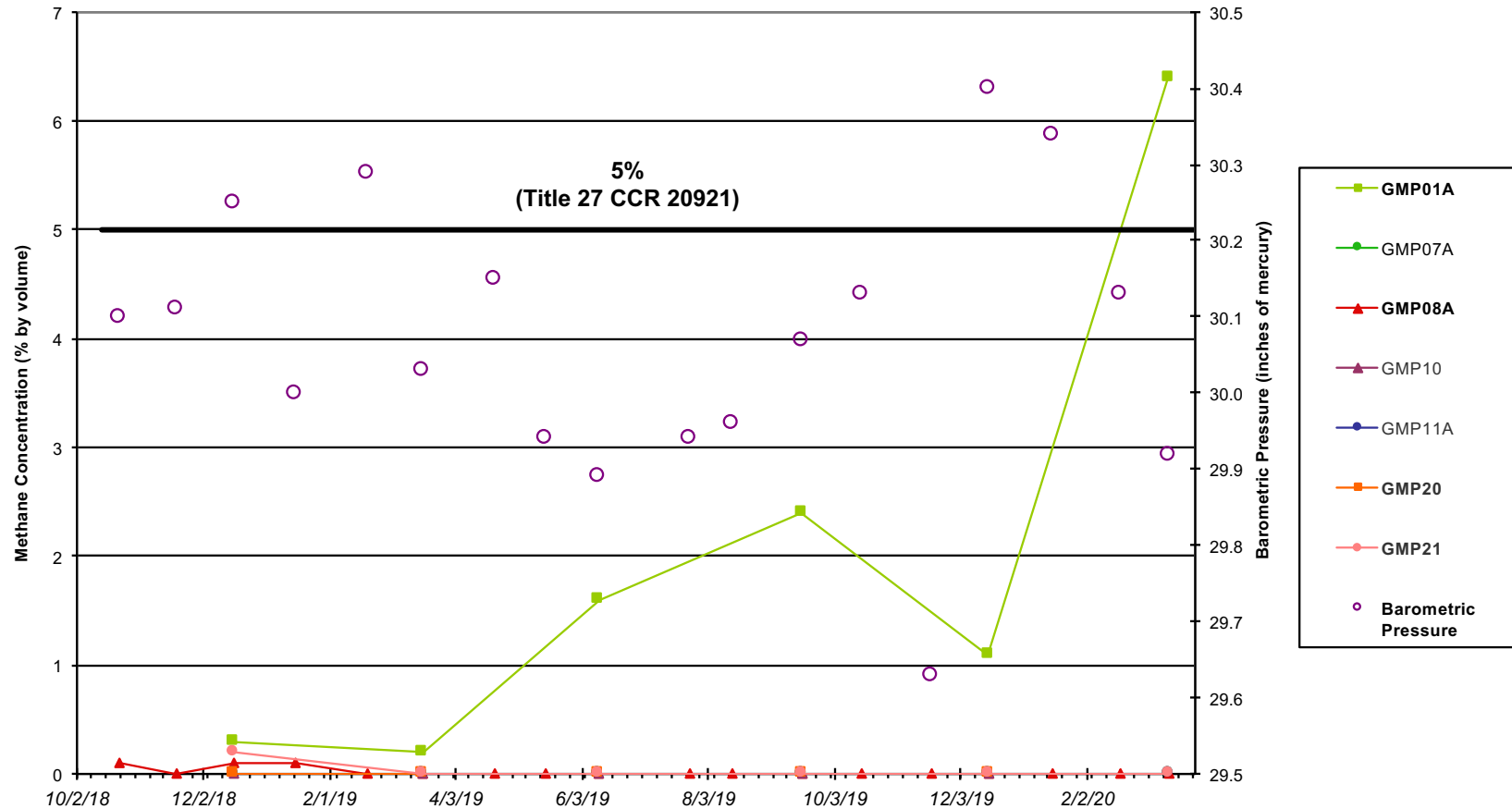


Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, all water level measurements will be collected quarterly rather than monthly (see Section 2.3 of the report text). Groundwater elevations are shown in blue for the groundwater monitoring location nearest GMP23 and GMP24. Results shown are for routine events only; no follow-up monitoring is displayed.

CH4 Methane
GWE Groundwater elevation, feet above mean sea level
GMP Gas monitoring probe

Hunters Point Naval Shipyard, San Francisco, CA
U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 8
Seasonal Patterns of
Methane Concentrations and Groundwater Elevations
near GMP23 and GMP24
December 2017 – March 2020

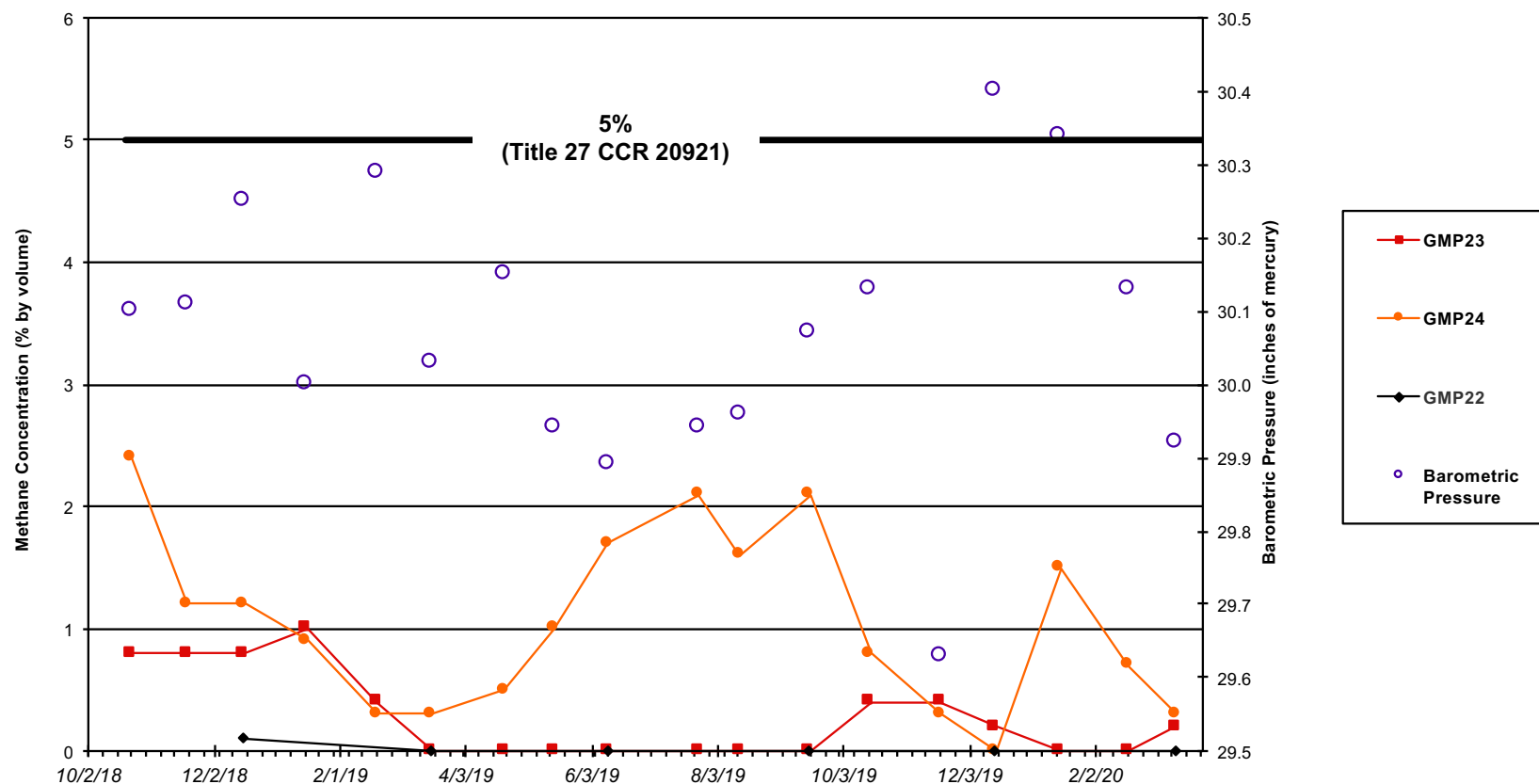


Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, monitoring has been discontinued at the following Fence Line locations: GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, and GMP12. Monitoring at GMP08A will continue monthly, while all other locations will be monitored quarterly (see Section 2.3 of the report text). GMPs with methane detections during the indicated interval are shown with legend entries in bold.

27 CCR Title 27 of the California Code of Regulations
GMP Gas monitoring probe

Hunters Point Naval Shipyard, San Francisco, CA
U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 9
Methane Concentrations and
Barometric Pressures for
GMPs at the Fence Line
October 2018 - March 2020

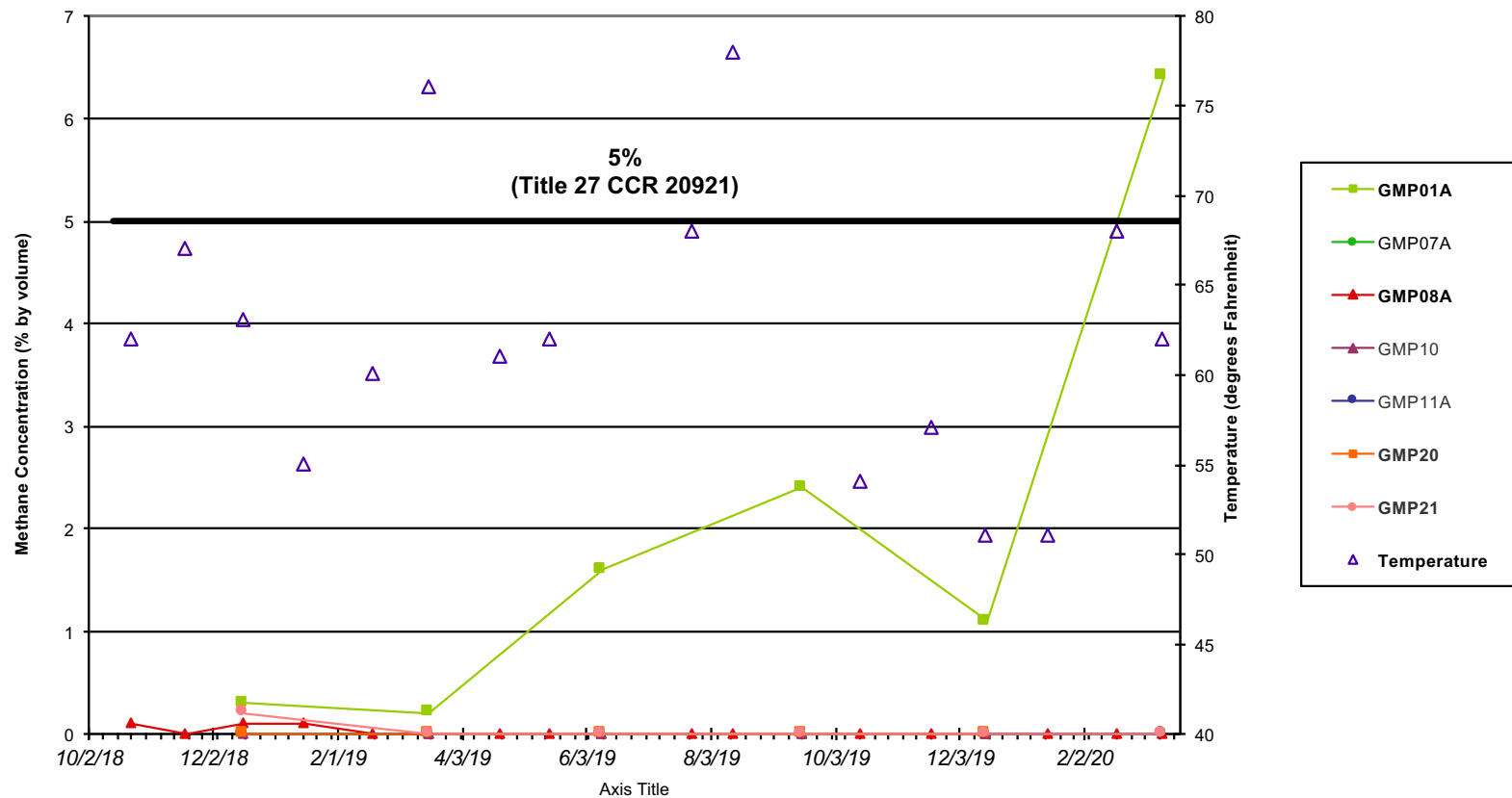


Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, monitoring has been discontinued at the following UCSF locations: GMP25 and GMP26. Monitoring at GMP23 and GMP24 will continue monthly, while GMP22 will be monitored quarterly (see Section 2.3 of the report text). In addition to the results for scheduled monitoring events, data shown on this figure reflect follow-up monitoring for any exceedances. GMPs with methane detections during the indicated interval are shown with legend entries in bold.

27 CCR Title 27 of the California Code of Regulations
GMP Gas monitoring probe
UCSF University of California, San Francisco

Hunters Point Naval Shipyard, San Francisco, CA
U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 10
Methane Concentrations and
Barometric Pressures for
GMPs at the UCSF Compound
October 2018 - March 2020

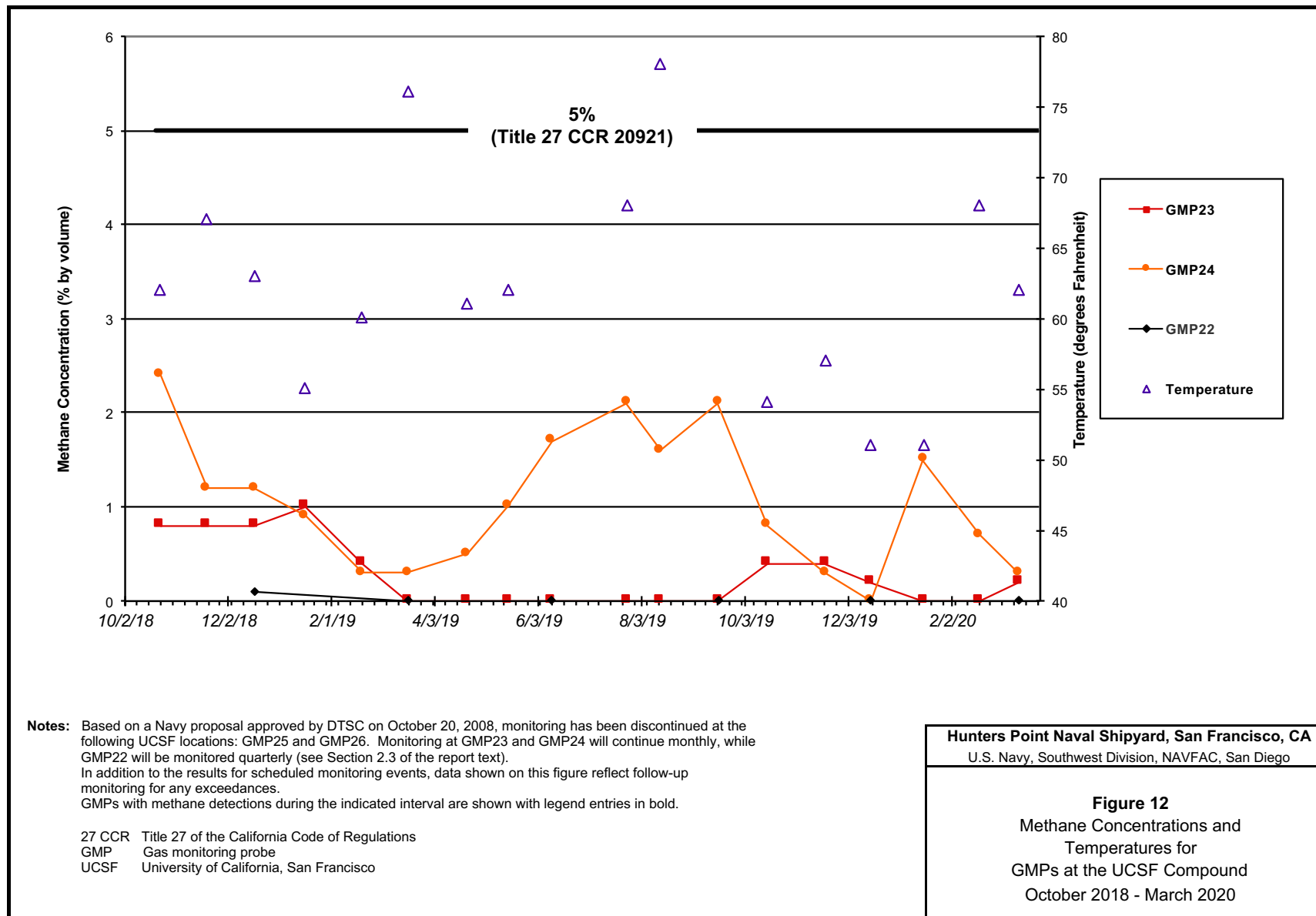


Notes: Based on a Navy proposal approved by DTSC on October 20, 2008, monitoring has been discontinued at the following Fence Line locations: GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, and GMP12. Monitoring at GMP08A will continue monthly, while all other Fence Line locations will be monitored quarterly (see Section 2.3 of the report text). GMPs with methane detections during the indicated interval are shown with legend entries in bold.

27 CCR Title 27 of the California Code of Regulations
GMP Gas monitoring probe

Hunters Point Naval Shipyard, San Francisco, CA
U.S. Navy, Southwest Division, NAVFAC, San Diego

Figure 11
Methane Concentrations and
Temperatures for
GMPs at the Fence Line
October 2018 - March 2020



TABLES

Table 1	Personnel and Equipment
Table 2	Landfill Gas Monitoring Locations
Table 3a	Daily Meteorological Data, October 2019
Table 3b	Daily Meteorological Data, November 2019
Table 3c	Daily Meteorological Data, December 2019
Table 4	Monthly Meteorological Summaries

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TABLE 1: PERSONNEL AND EQUIPMENT
Landfill Gas Monitoring, Post-Removal Action, Parcel E-2 Industrial Landfill

PERSONNEL		
Name	Responsibility	Company
Derrick Coleman	Project Manager	INYA Inc.
EQUIPMENT		
Sampling Apparatus	Manufacturer/Model	Purpose
Landfill Gas Meter	CES-LANDTEC GEM-2000	Monitor methane, oxygen, carbon dioxide, and lower explosive limit
Photoionization Detector (10.6 electron-volt lamp)	Mini-RAE 2000 PGM-7600	Monitor Non-Methane Organic Compounds
Air Sampling Pump	Gilian GilAir-5	Purge GMPs
Pressure Gauge	Magnehelic	Measure pressure in GMPs

TABLE 2: LANDFILL GAS MONITORING LOCATIONS
Landfill Gas Monitoring, Post-Removal Action, Parcel E-2 Industrial Landfill

Monitoring Location ⁽¹⁾	Description
Fence Line GMPs	GMP01A, GMP07A, GMP08A, GMP10, GMP11A, GMP20, and GMP21
UCSF Compound GMPs	GMP22, GMP23, and GMP24
Crisp Avenue GMPs	GMP32, GMP33, GMP34, and GMP35
Occupied Structure	Building 830 Crawlspace
On-Site Utilities	DP1 and DP2
Passive Vents	PV-01, PV-02 ⁽²⁾ , PV-03, PV-04, and PV-05
Extraction Wells ⁽³⁾	EX-5, EX-6, EX-7, and EX-8
Groundwater Elevation Locations	GMP32, GMP33, GMP34, GMP35, IR01MW02B, IR01MW03A, IR01MW05A, IR01MW10A, IR01MW11A, IR01MW12A, IR01P04A, and IR76MW13A
Additional Monitoring Locations	IR01MW16A, IR01MW18A, IR01MW366A, IR01MWI-5

Notes:

- (1) Based on a Navy proposal approved by the Department of Toxic Substances Control on October 20, 2008, monitoring was discontinued at the following locations, which therefore are not included in this table: GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, GMP12, GMP25, and GMP26. Monitoring at GMP08A, GMP23, and GMP24 will continue monthly, while all other locations will be monitored quarterly (see Section 2.3).
- (2) Active extraction point
- (3) Monitoring at extraction wells is required only if the control system is actively extracting from these locations; however, they also may be included as part of response action monitoring.

DP discharge point
GMP gas monitoring probe
IR Installation Restoration
MW monitoring well
PV passive vent
UCSF University of California, San Francisco

TABLE 3a: DAILY METEOROLOGICAL DATA, JANUARY 2020

Landfill Gas Monitoring, Post-Removal Action

Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
01/01/20	14.4	270	53	88	0.00	50.00	30.12	20.95
01/02/20	5.8	280	55	80	0.00	47.00	30.11	20.95
01/03/20	3.6	190	51	77	0.00	45.00	30.19	20.95
01/04/20	9.2	270	54	77	0.00	47.00	30.37	20.95
01/05/20	8.1	300	52	73	0.00	43.00	30.51	20.95
01/06/20	3.6	10	51	70	0.00	41.00	30.42	20.95
01/07/20	7.0	280	49	77	0.03	43.00	30.17	20.98
01/08/20	9.1	270	53	75	0.00	45.00	30.10	20.98
01/09/20	9.8	270	52	77	0.15	44.00	30.06	21.13
01/10/20	5.3	270	49	77	0.00	42.00	30.27	21.13
01/11/20	10.6	290	52	74	0.03	44.00	30.23	21.16
01/12/20	7.9	260	50	72	0.01	41.00	30.18	21.17
01/13/20	7.0	260	51	77	0.05	44.00	30.17	21.22
01/14/20	9.7	280	50	67	0.01	41.00	30.19	21.23
01/15/20	5.1	130	47	75	0.00	39.00	30.01	21.23
01/16/20	11.1	270	49	77	0.72	42.00	29.86	21.95
01/17/20	4.2	70	47	76	0.00	40.00	30.26	21.95
01/18/20	7.3	80	50	70	0.00	40.00	30.29	21.95
01/19/20	5.9	60	50	70	0.00	40.00	30.09	21.95
01/20/20	4.8	170	52	73	0.00	43.00	30.01	21.95
01/21/20	8.9	170	54	79	0.01	48.00	30.10	21.96
01/22/20	4.4	290	54	83	0.00	49.00	30.22	21.96
01/23/20	2.3	130	53	82	0.00	48.00	30.16	21.96
01/24/20	6.9	270	55	85	0.00	50.00	30.14	21.96
01/25/20	4.9	290	55	86	0.00	53.00	30.11	21.96
01/26/20	12.5	280	57	79	0.14	50.00	30.22	22.10
01/27/20	5.5	260	54	80	0.00	47.00	30.35	22.10

TABLE 3a: DAILY METEOROLOGICAL DATA, JANUARY 2020

Landfill Gas Monitoring, Post-Removal Action

Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
01/28/20	7.7	280	56	80	0.03	49.00	30.30	22.13
01/29/20	10.1	270	54	78	0.00	47.00	30.22	22.13
01/30/20	8.5	280	58		0.00		30.22	22.13
01/31/20	2.5	360	57		0.00		30.27	22.13

Notes:

Daily meteorological data are averages of hourly data except for daily precipitation, which is the sum of hourly precipitation data, and cumulative precipitation, which is the season-to-date total at the end of each day. Blank cells indicate not data was available.

⁽¹⁾ Cumulative precipitation is based on a January–December season.

°F degrees Fahrenheit
% percent
in. inches
mph miles per hour

TABLE 3b: DAILY METEOROLOGICAL DATA, FEBRUARY 2020

Landfill Gas Monitoring, Post-Removal Action
Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
02/01/20	8.4	280	56	88	0.00	50	30.24	22.13
02/02/20	21.8	290	50	64	0.00	40	30.11	22.13
02/03/20	11.7	350	47	43	0.00	26	30.14	22.13
02/04/20	10.9	350	50	44	0.00	28	30.24	22.13
02/05/20	5.6	280	51	66	0.00	38	30.21	22.13
02/06/20	4.6	280	55	75	0.00	44	30.13	22.13
02/07/20	8.4	280	54	81	0.00	46	30.11	22.13
02/08/20	10.5	270	53	72	0.00	44	30.03	22.13
02/09/20	22.4	20	53	43	0.00	34	29.98	22.13
02/10/20	5.3	350	60	40	0.00	32	30.01	22.13
02/11/20	4.1	280	61	42	0.00	34	30.03	22.13
02/12/20	6.9	280	57	70	0.00	44	30.01	22.13
02/13/20	7.1	270	50	75	0.00	43	30.06	22.13
02/14/20	6.7	280	54	71	0.00	43	30.09	22.13
02/15/20	8.6	270	53	73	0.00	45	30.17	22.13
02/16/20	15.5	270	55	78	0.00	47	30.19	22.13
02/17/20	5.4	280	58	66	0.00	42	30.06	22.13
02/18/20	8.1	270	58	47	0.00	34	30.01	22.13
02/19/20	6.9	280	55	71	0.00	43	30.08	22.13
02/20/20	4.1	280	56	64	0.00	43	30.09	22.13
02/21/20	5	280	60	58	0.00	43	30.01	22.13
02/22/20	13	270	56	71	0.00	46	30.01	22.13
02/23/20	16.6	260	55	75	0.00	45	30.30	22.13
02/24/20	7.2	270	57	70	0.00	44	30.31	22.13

TABLE 3b: DAILY METEOROLOGICAL DATA, FEBRUARY 2020

Landfill Gas Monitoring, Post-Removal Action
 Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
02/25/20	4.4	290	62	49	0.00	39	30.24	22.13
02/26/20	4.9	280	61	58	0.00	43	30.26	22.13
02/27/20	3.1	280	63	62	0.00	46	30.17	22.13
02/28/20	8.4	280	59	75	0.00	49	30.09	22.13
02/29/20	25.3	270	53	67	0.00	42	30.03	22.13

Notes:

Daily meteorological data are averages of hourly data except for daily precipitation, which is the sum of hourly precipitation data, and cumulative precipitation, which is the season-to-date total at the end of each day.

⁽¹⁾ Cumulative precipitation is based on a January–December season.

°F degrees Fahrenheit
 % percent
 in. inches
 mph miles per hour

TABLE 3c: DAILY METEOROLOGICAL DATA, MARCH 2020
Landfill Gas Monitoring, Post-Removal Action, Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
03/01/20	11.8	280	52	n/d	0.00	n/d	29.96	22.13
03/02/20	14.3	350	63	n/d	0.00	n/d	30.01	22.13
03/03/20	6.3	290	63	n/d	0.00	n/d	29.99	22.13
03/04/20	5.1	290	62	n/d	0.00	n/d	30.04	22.13
03/05/20	6.7	240	56	n/d	0.00	n/d	30.10	22.13
03/06/20	10.1	230	54	n/d	T	n/d	29.96	22.13
03/07/20	6.9	270	53	n/d	0.08	n/d	29.92	22.21
03/08/20	4.9	210	53	n/d	0.00	n/d	29.98	22.21
03/09/20	3.8	350	58	n/d	0.00	n/d	30.06	22.21
03/10/20	5.3	280	61	n/d	0.00	n/d	29.98	22.21
03/11/20	10.1	270	60	n/d	0.00	n/d	30.01	22.21
03/12/20	9.1	280	59	n/d	0.00	n/d	29.82	22.21
03/13/20	12.4	200	55	n/d	0.00	n/d	29.78	22.21
03/14/20	9.2	270	52	n/d	0.46	n/d	29.93	22.67
03/15/20	10.8	220	52	n/d	0.20	n/d	29.93	22.87
03/16/20	8.4	50	50	n/d	0.13	n/d	29.89	23.00
03/17/20	6.9	280	50	n/d	0.01	n/d	29.93	23.01
03/18/20	7.9	270	52	n/d	0.01	n/d	29.86	23.02
03/19/20	6.0	280	54	n/d	0.00	n/d	30.01	23.02
03/20/20	5.5	280	54	n/d	0.00	n/d	30.15	23.02
03/21/20	5.3	280	55	n/d	T	n/d	30.11	23.02
03/22/20	5.1	200	58	n/d	T	n/d	30.03	23.02
03/23/20	9.5	270	55s	n/d	0.00	n/d	30.09	23.02
03/24/20	9.2	180	52	n/d	0.13	n/d	30.11	23.15

TABLE 3c: DAILY METEOROLOGICAL DATA, MARCH 2020
Landfill Gas Monitoring, Post-Removal Action, Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
03/25/20	12.1	270	51	n/d	0.06	n/d	30.04	23.21
03/26/20	11.5	280	50	n/d	0.00	n/d	30.04	23.21
03/27/20	14.5	270	53	n/d	0.00	n/d	30.14	23.21
03/28/20	6.0	230	54	n/d	0.04	n/d	30.15	23.25
03/29/20	7.2	280	55	n/d	0.20	n/d	30.11	23.45
03/30/20	6.9	270	56	n/d	0.00	n/d	30.27	23.45
03/31/20	11.4	270	58	n/d	0.00	n/d	30.14	23.45

Notes:

Daily meteorological data are averages of hourly data except for daily precipitation, which is the sum of hourly precipitation data, and cumulative precipitation, which is the season-to-date total at the end of each day.

⁽¹⁾ Cumulative precipitation is based on a January–December season.

°F degrees Fahrenheit
% percent
in. inches
mph miles per hour
n/d no data
T Trace of rainfall (not measureable)

TABLE 4: MONTHLY METEOROLOGICAL SUMMARIES, OCTOBER 2018 - MARCH 2020

Landfill Gas Monitoring, Post-Removal Action, Parcel E-2 Industrial Landfill

Date	Wind Speed (mph)	Wind Direction (degrees)	Air Temperature (°F)	Relative Humidity (%)	Daily Precipitation (inches)	Dew Point (°F)	Barometric Pressure	Cumulative Precipitation (inches) ⁽¹⁾
							(in. mercury)	
October 2018	9	280	63	78	0.01	50	30.02	11.07
November 2018	7	240	55	71	0.10	45	30.12	14.15
December 2018	7	190	53	79	0.05	52	30.20	15.80
January 2019	8	275	59	76	0.01	48	29.12	10.91
February 2019	10	240	59	78	0.07	48	30.01	10.91
March 2019	9	260	55	80	0.12	52	30.14	10.91
April 2019	9	245	61	79	0.01	50	30.09	13.89
May 2019	10	250	59	79	0.07	48	30.00	15.92
June 2019	10	270	66	76	0.00	52	29.94	15.92
July 2019	14	280	72	74	0.00	53	29.99	15.92
August 2019	13	275	76	73	0.00	56	29.97	15.92
September 2019	13	275	76	71	0.00	54	29.97	15.98
October 2019	20	240	74	42	0.00	43	30.05	15.98
November 2019	18	215	63	66	0.04	45	30.05	17.17
December 2019	16	150	58	76	0.12	47	30.12	20.95
January 2020	6	205	47	64	0.04	37	27.27	22.13
February 2020	8	245	50	57	0.00	37	27.00	22.13
March 2020	7	230	48	--	0.04	--	27.12	23.45

Notes:

Monthly meteorological data are averages of hourly measurements except for monthly precipitation, which is the sum of hourly precipitation data, and cumulative precipitation (based on a calendar-year season), which is the season-to-date total on the last day of each month.

⁽¹⁾ Cumulative precipitation is based on a January–December season.

°F degrees Fahrenheit

% percent

in. inches

mph miles per hour

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APPENDIX A

LANDFILL GAS AND WATER-LEVEL MONITORING LOGS

Table A-1	Landfill Gas Monitoring Log - January 2020
Table A-1	Landfill Gas Monitoring Log - February 2020
Table A-3	Landfill Gas Monitoring Log - March 2020
Table A-4	Water Level Monitoring Log – March 2020
Table A-5	Landfill Gas Monitoring Follow-up - April 2020

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TABLE A-1: LANDFILL GAS MONITORING LOG - JANUARY 2020

Weather: cold, overcast

Name: Colin Rowland

Sampling Location		Date	Time	Temp (°F)	Barometric Pressure (in. Hg)	GEM-2000				PID		Soil Gas Pressure (in. H ₂ O)	Notes (e.g., active extraction, flow rate, probe damage, instrument issues)
Location ID	Description (for example, GMP, Well, Carbon, Hydrosil)					Methane (%)	CO ₂ (%)	O ₂ (%)	Percent of LEL	Non- Methane VOCs (ppmv)	Bckgrd. NMOCs (ppmv)		
GMP08A	Gas Monitoring Probe	1/16/20	8:38	50	30.34	0.0	3.4	0.7	0	0.0	0.0	0.0	
GMP23	Gas Monitoring Probe	1/16/20	8:50	50	30.34	0.0	8.9	20.3	0	0.8	0.0	0.0	
GMP24	Gas Monitoring Probe	1/16/20	9:03	51	30.34	0.1	13.9	0.8	34	0.3	0.0	0.0	

Legend:

%: percent by volume in air
°F: degrees Fahrenheit
CO₂: carbon dioxide
GEM-2000: CES-LANDTEC landfill gas meter
in. Hg: inches of mercury
in. H₂O: inches of water
LEL: lower explosive limit

NA: not applicable
NMOC: non-methane organic compound
O₂: oxygen
PID: photoionization detector
ppmv: parts per million by volume
VOC: volatile organic compound

TABLE A-2: LANDFILL GAS MONITORING LOG - FEBRUARY 2020

Weather: cool, windy

Name: Colin Rowland

Sampling Location		Date	Time	Temp (°F)	Barometric Pressure (in. Hg)	GEM-2000				PID		Soil Gas Pressure (in. H ₂ O)	Notes (e.g., active extraction, flow rate, probe damage, instrument issues)
Location ID	Description (for example, GMP, Well, Carbon, Hydrosil)					Methane (%)	CO ₂ (%)	O ₂ (%)	Percent of LEL	Non- Methane VOCs (ppmv)	Bckgrd. NMOCs (ppmv)		
GMP08A	Gas Monitoring Probe	2/18/20	10:48	78	30.13	0.0	4.3	0.0	0	0.0	0.0	0.0	
GMP23	Gas Monitoring Probe	2/18/20	10:55	68	30.13	0.0	12.5	1.5	0	0.0	0.0	0.0	
GMP24	Gas Monitoring Probe	2/18/20	11:02	62	30.13	0.7	11.3	0.0	16	0.0	0.0	0.0	

Legend:

%: percent by volume in air
°F: degrees Fahrenheit
CO₂: carbon dioxide
GEM-2000: CES-LANDTEC landfill gas meter
in. Hg: inches of mercury
in. H₂O: inches of water
LEL: lower explosive limit

NA: not applicable
NMOC: non-methane organic compound
O₂: oxygen
PID: photoionization detector
ppmv: parts per million by volume
VOC: volatile organic compound

TABLE A-3: LANDFILL GAS MONITORING LOG - MARCH 2020

Weather: sunny, cool

Sampling Location						GEM-2000				PID			Notes (e.g., active extraction, flow rate, probe damage, instrument issues)
Location ID	Description (for example, GMP, Well, Carbon, Hydrosil)	Date	Time	Temp (°F)	Barometric Pressure (in. Hg)	Methane (%)	CO ₂ (%)	O ₂ (%)	Percent of LEL	Non-Methane VOCs (ppmv)	Bckgrd. NMOCs (ppmv)	Soil Gas Pressure (in. H ₂ O)	
FENCE LINE													
GMP01A	Gas Monitoring Probe	3/12/2020	9:22	59	29.98	6.4	20.0	0.0	>100	0.0	0.0	0.0	
GMP07A	Gas Monitoring Probe	3/12/2020	8:39	51	29.98	0.0	9.1	7.7	0	0.0	0.0	0.0	
GMP08A	Gas Monitoring Probe	3/12/2020	8:05	56	29.98	0.0	4.9	0.0	0	0.1	0.0	0.0	
GMP10	Gas Monitoring Probe	3/12/2020	--	--	--	--	--	--	--	--	--	--	See notes
GMP11A	Gas Monitoring Probe	3/12/2020	9:41	56	29.98	0.0	7.9	13.3	0	0.0	0.0	0.0	
GMP20	Gas Monitoring Probe	3/12/2020	--	--	--	--	--	--	--	--	--	--	See notes
GMP21	Gas Monitoring Probe	3/12/2020	9:48	59	29.98	0.0	8.2	3.2	0	0.0	0.00	0.00	
UCSF COMPOUND													
GMP22	Gas Monitoring Probe	3/12/2020	10:44	72	29.92	0.0	4.8	16.0	0	0.0	0.0	0.0	
GMP23	Gas Monitoring Probe	3/12/2020	10:50	62	29.92	0.2	14.2	0.1	4	0.8	0.0	0.0	
GMP24	Gas Monitoring Probe	3/12/2020	11:09	63	29.92	0.3	12.8	0.0	7	0.2	0.0	0.0	
CRISP AVENUE LOCATIONS													
GMP32	Gas Monitoring Probe	3/12/2020	12:08	72	29.91	0.0	0.7	21.9	0	0.0	0.0	0.0	
GMP33	Gas Monitoring Probe	3/12/2020	12:00	73	29.88	0.0	0.3	19.0	0	0.0	0.0	0.0	
GMP34	Gas Monitoring Probe	3/12/2020	11:47	71	29.88	0.0	4.1	14.1	0	0.0	0.0	0.0	
GMP35	Gas Monitoring Probe	3/12/2020	11:19	70	29.92	0.0	2.2	19.3	0	0.0	0.0	0.0	
STRUCTURAL LOCATIONS													
830crawlspace	Bldg. 830 Ambient	3/12/2020	10:54	58	29.92	0.0	0.1	20.0	0	0.0	0.0	NA	
DP1	Drainage Catch Basin	3/12/2020	10:57	60	29.92	0.0	0.0	20.1	0	0.0	0.0	NA	
DP2	Drainage Catch Basin	3/12/2020	8:46	53	29.98	0.0	0.1	20.0	0	0.0	0.0	NA	
CONTROL SYSTEM													
PV-01influent	Passive Sys. Influent	3/12/2020	9:34	57	29.98	63.6	28.0	0.0	>100	0.0	0.0	NA	Valve broken
PV-01carbon1	Passive Sys. 1st Carbon	3/12/2020	9:36	56	29.98	43.2	23.0	4.5	>100	0.0	0.0	NA	
PV-01hydrosil	Passive Sys. Hydrosil	3/12/2020	9:37	55	29.98	0.0	0.0	20.2	0	0.0	0.0	NA	
PV-02influent	Active Sys. Influent	3/12/2020	9:03	55	29.98	0.0	5.2	20.9	0	1.5	0.0	NA	Active extraction
PV-02carbon1	Active Sys. 1st Carbon	3/12/2020	9:07	56	29.98	0.0	0.0	20.4	0	0.0	0.0	NA	Active extraction
PV-02hydrosil	Active Sys. Hydrosil	3/12/2020	9:08	57	29.98	0.0	0.0	20.4	0	0.0	0.0	NA	Active extraction

TABLE A-3: LANDFILL GAS MONITORING LOG - MARCH 2020

Weather: sunny, cool

Sampling Location						GEM-2000				PID		Notes (e.g., active extraction, flow rate, probe damage instrument issues)	
Location ID	Description (for example, GMP, Well, Carbon, Hydrosil)	Date	Time	Temp (°F)	Barometric Pressure (in. Hg)	Methane (%)	CO ₂ (%)	O ₂ (%)	Percent of LEL	Non- Methane VOCs (ppmv)	Bckgrd. NMOCs (ppmv)	Soil Gas Pressure (in. H ₂ O)	
CONTROL SYSTEM													
PV-03influent	Passive Sys. Influent	3/12/2020	8:50	51	29.98	12.9	10.3	14.5	>100	0.0	0.0	NA	Valve broken
PV-03carbon1	Passive Sys. 1st Carbon	3/12/2020	8:52	52	29.98	26.2	18.3	4.7	>100	0.0	0.0	NA	
PV-03hydrosil	Passive Sys. Hydrosil	3/12/2020	8:54	52	29.98	0.0	0.1	20.4	0	0.0	0.0	NA	
PV-04influent	Passive Sys. Influent	3/12/2020	8:21	56	29.98	61.1	29.6	0.0	>100	0.8	0.0	NA	
PV-04carbon1	Passive Sys. 1st Carbon	3/12/2020	8:25	53	29.98	59.2	26.3	0.0	>100	0.0	0.0	NA	
PV-04hydrosil	Passive Sys. Hydrosil	3/12/2020	8:27	53	29.98	0.0	0.1	20.4	0	0.0	0.0	NA	
PV-05influent	Passive Sys. Influent	3/12/2020	9:13	58	29.98	0.0	0.3	20.1	0	0.0	0.0	NA	
PV-05carbon1	Passive Sys. 1st Carbon	3/12/2020	9:17	58	29.98	0.0	0.1	20.1	0	0.0	0.0	NA	Probe clogged?
PV-05hydrosil	Passive Sys. Hydrosil	3/12/2020	9:19	58	29.98	0.0	0.1	20.1	0	0.0	0.0	NA	Probe clogged?
OTHER MONITORING LOCATIONS													
IR01MW366A	Landfill Cap Well	3/12/2020	10:19	58	29.94	25.9	9.2	13.4	>100	0.0	0.0		
IR01MWI-5	Landfill Cap Well	3/12/2020	10:14	62	29.94	64.8	29.6	0.1	>100	0.0	0.0		
IR01MW18A	Landfill Cap Well	3/12/2020	10:12	64	29.98	0.0	0.1	20.1	0	0.0	0.0		
IR01MW16A	Landfill Cap Well	3/12/2020	--	--	--	--	--	--	--	--	--	--	See notes

Notes: Based on a Navy proposal approved by DTSC on 20 October 2008, monitoring has been discontinued at GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, GMP12, GMP25, and GMP26. These locations are therefore not included in this table. GMP13, GMP14, GMP15, GMP16, GMP17, GMP18, GMP19, GMP27, GMP28, GMP29, GMP30, and GMP31 have been removed by trenching activities on Crisp Avenue, and were therefore not monitored. GMP10, GMP20, and IR01MW16A were inaccessible during this monitoring event due to ongoing site activities associated with the installation of the final remedy.

Legend:

%:	percent by volume in air	NA:	not applicable
°F:	degrees Fahrenheit	NMOC:	non-methane organic compound
CO ₂ :	carbon dioxide	O ₂ :	oxygen
GEM-2000:	CES-LANDTEC landfill gas meter	PID:	photoionization detector
in. Hg:	inches of mercury	ppmv:	parts per million by volume
in. H ₂ O:	inches of water	VOC:	volatile organic compound
LEL:	lower explosive limit		

TABLE A-4: WATER LEVEL MONITORING LOG - DECEMBER 2019

Weather: sunny, cool

Name: Lindsey Barger/Colin Rowland

Location ID	Description (for example, GMP / Well / Carbon / Hydrosil)	Date	Time	TOC (ft above msl)	Water Level (feet below top of casing)	Groundwater Elevation (feet above mean sea level)
GMP32	Gas Monitoring Probe	3/12/20	12:05	14.02	9.84	4.18
GMP33	Gas Monitoring Probe	3/12/20	11:57	24.59	12.05	12.54
GMP34	Gas Monitoring Probe	3/12/20	11:48	22.28	15.04	7.24
GMP35	Gas Monitoring Probe	3/12/20	11:32	19.11	12.70	6.41
IR01MW02B	Well	3/12/20	9:27	20.61	14.57	6.04
IR01MW03A	Well	3/12/20	9:29	19.89	13.48	6.41
IR01MW05A	Well	3/12/20	9:59	22.56	16.07	6.49
IR01MW10A	Well	3/12/20	8:15	13.75	8.59	5.16
IR01MW11A	Well	3/12/20	8:34	17.96	12.77	5.19
IR01MW12A	Well	3/12/20	8:33	18.25	12.63	5.62
IR01P04A	Well	3/12/20	9:30	21.61	12.10	9.51
IR76MW13A	Well	3/12/20	10:40	19.69	14.84	4.85

Notes: IR74MW01A, GMP27, GMP28, GMP29, GMP30, and GMP31 have been removed by trenching activities on Crisp Avenue. IR01P03AA and IR01P03AB have been abandoned.

TABLE A-5: LANDFILL GAS MONITORING FOLLOW-UP - APRIL 2020

Weather: cool, sunny

Name: Colin Rowland

Sampling Location		Date	Time	Temp (°F)	Barometric Pressure (in. Hg)	GEM-2000				PID			Notes (e.g., active extraction, flow rate, probe damage, instrument issues)
Location ID	Description (for example, GMP, Well, Carbon, Hydrosil)					Methane (%)	CO ₂ (%)	O ₂ (%)	Percent of LEL	Non- Methane VOCs (ppmv)	Bckgrd. NMOCs (ppmv)	Soil Gas Pressure (in. H ₂ O)	
GMP01A	Gas Monitoring Probe	4/23/20	9:13	70	30.30	5.4	22.7	0.0	>100	0.0	0.0	0.0	
GMP01A	Gas Monitoring Probe	4/23/20	9:30	69	30.30	4.1	21.9	0.0	82	0.0	0.0	0.0	
GMP01A	Gas Monitoring Probe	4/30/20	8:46	64	30.14	3.7	21.0	0.0	64	0.0	0.0	0.0	
GMP01A	Gas Monitoring Probe	4/30/20	9:23	65	30.15	3.6	20.2	0.0	62	0.0	0.0	0.0	
GMP01A	Gas Monitoring Probe	5/12/20	9:58	73	30.01	3.6	21.7	0.0	67	0.0	0.0	0.0	

Legend:

%: percent by volume in air
°F: degrees Fahrenheit
CO₂: carbon dioxide
GEM-2000: CES-LANDTEC landfill gas meter
in. Hg: inches of mercury
in. H₂O: inches of water
LEL: lower explosive limit

NA: not applicable
NMOC: non-methane organic compound
O₂: oxygen
PID: photoionization detector
ppmv: parts per million by volume
VOC: volatile organic compound

APPENDIX B

OTHER MONITORING RESULTS

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**TABLE B-1: METHANE, NMOC, OXYGEN, AND CARBON DIOXIDE
CONCENTRATIONS AT LANDFILL CAP WELLS**

Landfill Gas Monitoring, Post-Removal Action
Parcel E-2 Industrial Landfill

Location ⁽¹⁾	Methane (% by volume) ⁽³⁾	NMOCs (ppmv) ⁽³⁾	Oxygen (% by volume) ⁽³⁾	Carbon Dioxide (% by volume) ⁽³⁾
March 12, 2020⁽²⁾				
IR01MW366A	25.9	0.0	13.4	9.2
IR01MWI-5	64.8	0.0	0.1	29.6
IR01MW18A	0.0	0.0	20.1	0.1
IR01MW16A ⁽⁴⁾	--	--	--	--

Notes:

- (1) The regulatory limit of 5% methane by volume does not apply to these monitoring wells, which are located on the landfill (locations are shown on Figure 2).
- (2) Based on a Navy proposal approved by the Department of Toxic Substances Control on October 20, 2008, monitoring has been discontinued at the following locations: GMP02A, GMP03, GMP04A, GMP05B, GMP06B, GMP09, GMP12, GMP25, and GMP26. Monitoring at GMP08A, GMP23, and GMP24 will continue monthly, while all other locations, including the landfill cap wells reported in this table, will be monitored quarterly (see Section 2.3).
- (3) Results are from the handheld equipment identified in Table 1.
- (4) Location inaccessible due to ongoing construction activities associated with the implementation of the final remedy.

IR Installation Restoration
MW Monitoring well
NMOC Non-methane organic compound
ppmv parts per million by volume
% percent

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